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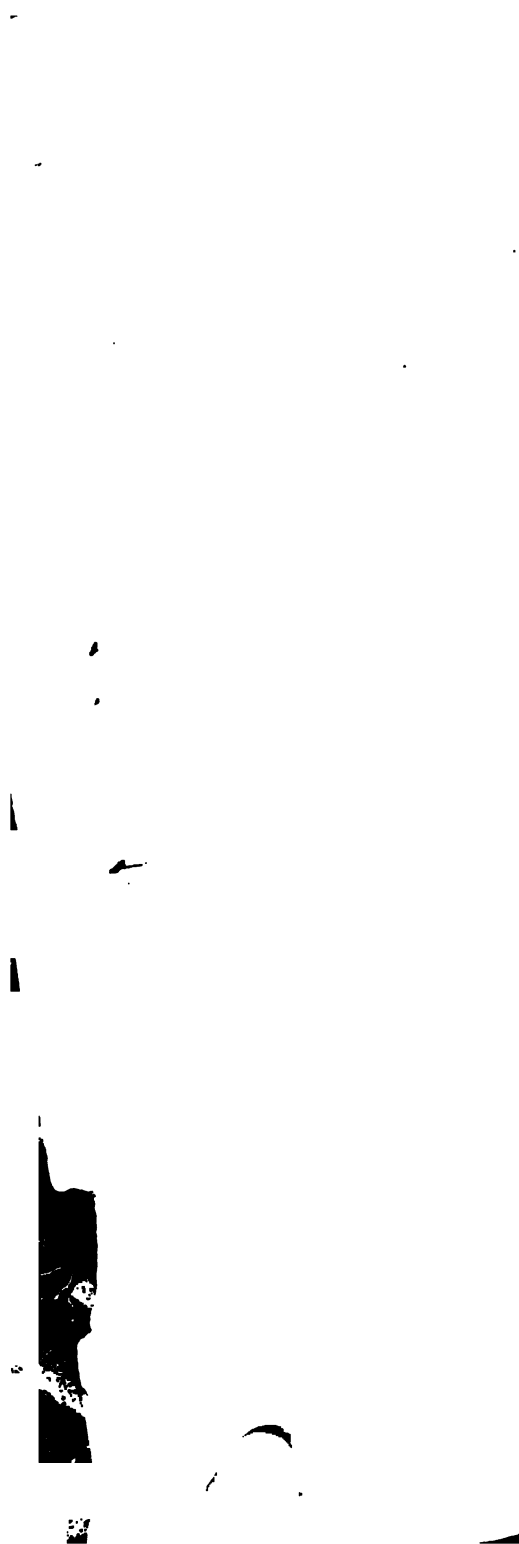
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THE  
EARTHQUAKE CATALOGUE

OF THE

BRITISH ASSOCIATION,

WITH THE

DISCUSSION, CURVES, AND MAPS, ETC.

STANFORD LIBRARY

BY

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[*From the* TRANSACTIONS OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT  
OF SCIENCE, 1852 to 1858.]

BEING THIRD AND FOURTH REPORTS.

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*Catalogue of recorded Earthquakes from 1606 B.C. to A.D. 1850.*

1. <i>Date. BEFORE CHRIST.</i>	2. <i>Locality.</i>	3. <i>Direction, duration, and number of shocks.</i>	4. <i>Phenomena connected with the sea.</i>	5. <i>Meteorological and other phenomena.</i>	6. <i>Authority.</i>
1606 .....	Mount Sinai .....	.....	.....	Accompanied by thunder and lightning; on the occasion of the delivery of the law.	Exodus, xix. 18.
Between 1604 and 1586.	Arabia .....	.....	.....	Korah, Dathan, and Abiram swallowed up .....	Numbers, xvi. 31.
1566 .....	Jericho .....	.....	.....	The walls of the city thrown down .....	Joshua, vi.
About 1450...	Lacus Cimini, in central Italy.	.....	.....	A city swallowed up, and a lake produced in its place.	Sotion, quoted in Aristot. Op. ed. Sylburgi, vol. ii. sec. 6. p. 128; and Amm. Marcell. lib. xvii. c. 7. sec. 13.
About 900 ...	Palestine .....	.....	.....	After Elijah had prayed for rain from heaven .....	1 Kings, xix. 11.
About 900 ...	The Alban Lake, in Italy .....	.....	.....	.....	Aurel. Victor, de orig. gent. Rom. c. 18; and Dion. Halic. lib. i. c. 24.
890, or betw <sup>n</sup> this and 870.	Palestine .....	.....	.....	.....	Amos, i. 1; and Zechariah, xiv. 5.
595 .....	China .....	.....	.....	.....	Du Halde, Description de la Chine, t. i. p. 326.
About 530, or betw <sup>n</sup> this and 520.	Lacedaemon .....	.....	.....	A portion of Mount Taygetus thrown down .....	Strabo, lib. viii. iii. p. 202; and Pliny, lib. ii. c. 79 (81).
486 .....	The Island of Delos .....	.....	.....	Herodotus remarks that this was the first time, up to the period at which he wrote, that this island had experienced earthquake shocks. Others also speak of it as free from such cala-	Herodotus, Erato, c. 98; and Strabo, lib. x. iv. p. 313.



1.	2.	3.	4.	5.	6.
432, or 431... 431, or soon after.	Roman territories Delos			Houses were thrown down	Livy, lib. iv. c. 21. Thucydides, lib. ii. c. 8. Thucydides, lib. iii. c. 37.
426	Athens, Eubœa, Boœtia, and especially Orcho- menos.				Thucydides, lib. iii. c. 89; and Dio- dorus, lib. xii. c. 59.
425	In Greece, especially in Eubœa, and Ahalante.		Accompanied by great inundations of the sea.	Shortly after an eclipse of the sun	Thucydides, lib. iv. c. 54. Balbi, Essai politique sur la Roy- aume de Portugal, t. i. p. 102.
424. In spring	In the Peloponnesus.				Strabo, lib. i. and viii.; and Pappa- nias, lib. vii.; Achaica, c. 24—25.
377	Lisbon				Balbi, t. i. p. 102.
373	Peloponnesus, especially at Helike and Bura.		Great inundations of the sea, overwhelm- ing Helike.		Livy, lib. vii. c. 6; and Pliny, Hist. Nat. lib. xv. c. 18 (20).
370	Lisbon			A great chasm opened in the forum, which after- wards filled with water, forming the Lacus Curtius. <i>Probably</i> an earthquake.	Ukert upon Lemnos and Mosychlos in the allgem. geograph. Ephemer. for Dec. 1812.
364	Rome			The island was sunk into the sea	Kämpfer, (v. Dohm.) Japan, vol. i. p. 190; v. Humboldt, Frag. de Géogr. Asiat. vol. i. p. 223.
Before 323	Island of Chryse, near Lemnos.				Justinus, lib. xxiv. c. 8.
285, or 284	In the provinces Oomi and Sourouga of the Japanese island Ni- phon.			In the province of Oomi a large tract of land sank in one night, forming a lake 72½ miles long and 12½ wide. In Sourouga volcanic eruptions, and the mountain Fousi-no-Yama, still an active volcano, was thrown up.	Justinus, lib. xvii.; at the beginning.
282	Delphi			A portion of a hill thrown down; the earthquake followed by a violent storm of hail.	Orosius, lib. iv. c. 4.
About the same time.	Country about the Cher- sonesus and Hellespont.			The city Lyaimachia destroyed	Eusebius v. Hoff. Chronik vol. i. p. 110
276, or per- haps 271.	Probably near Picentia in the south of Campania.			Accompanied "horrendo fragore"	
224	Carthage, and the island of Rhodes.			The colossus of Rhodes thrown down.	(ii. p. 235 and 236)

## ON THE FACTS OF EARTHQUAKE PHÆNOMENA.

At the same time, or very soon after.	At the same time, or very soon after.	A hundred towns destroyed	Augustinus de Mirabilibus, lib. ii.
218	"In vico Istrico (or Instatio)," round.	No shock mentioned. The water of a well burst forth in an extraordinary manner.	Livy, lib. xxiv. c. 10.
197	Rome, or the country round.	Shocks continuing for thirty-eight days	Livy, lib. xxiv. c. 55.
197, or 196	Italy	Many towns ruined	Livy, lib. xxxv. c. 40.
About the same time.	About the Rhodes, and parts of Asia Minor.	The public statues of the gods were moved	Justinus, lib. xxx. c. 4.
184, or 183	Rome	Many buildings thrown down	Livy, lib. xli. c. 59.
177, or 178	Country of the Sabines		Livy, lib. xli. c. 28.
175	China		Edinburgh Encyclopedia, Article Chronology.
140	China		Kämpfer, Japan, vol. i. p. 193.
138	Luna, near Carrara	Perhaps only a landslide	Julius Obsequens.
123—122	Privernum, in Latium	Seven acres of land sank into the earth. Perhaps not an earthquake.	Julius Obsequens.
122—121	Probably at Rome: place not mentioned	Accompanied by subterranean noise	Julius Obsequens.
104—103	In the territory of Picenum.	Ditto	Julius Obsequens.
103—102	Nursia	Buildings thrown down; accompanied by subterranean noise.	Julius Obsequens.
101—100	Pesaro	Accompanied by noise; buildings thrown down	Julius Obsequens.
99—98	Venafrum	No shock mentioned; the earth opened and sank down.	Julius Obsequens.
96—95	Ferula	No shock, but subterranean noise (fremitus)	Julius Obsequens.
95—94	Rhegium	Buildings injured	Julius Obsequens.
95	Syria, and the Island of Cyprus.		v. Hoff, vol. ii. p. 137; without quoting authority.
92	Province of Omi in Nippon, Japan.	An island (now called Tsikou-bo-sima) was raised in the lake produced in the year 285 a.c.	Humboldt, Frag. de Géogr. Asiat. t. i. p. 223.
85, or 82	Reate, in the country of the Sabines.	Great damage done to buildings, bridges, &c.; attended by subterranean noise.	Julius Obsequens.
80—79	Spoleto		Julius Obsequens.



79. At night Misenum, and the country round.	The sea receded from the coast.	The houses trembled; followed the day after by the eruption of Vesuvius, in which Herculaneum and Pompeii were destroyed.	Eusebius, p. 281. Only in the Armenian and Latin; Orosius, lib. vii. c. 12.
† 105, or 106... Asia Minor, and parts of Greece.		Three cities destroyed	Eusebius, p. 283; Orosius, lib. vii. c. 12.
† 109, or 110... Galatia		From 107 to 115 several earthquakes took place in China, of which this was the most violent.	Du Halde, i. 365.
† 115... China		Violent winds and thunder preceded the earthquake.	Eusebius, p. 283. Not in the Greek.
† 115, or 117... Antiochia			Calvisius, p. 283. Not in the Greek.
† 121, or 122... Nicomedia and Nicæa in Bithynia.			Eusebius, p. 285.
† 127, or 128... Nicopolis and Neocæsarea in Pontus, and Hierapolis, Laodicea, and Nicomedia; also at Syracuse.			
† 131... Sicily			
† 150, or shortly before. Caria, Lycia, and the island of Rhodes.			v. Hoff, vol. ii. p. 227. Authority not quoted.
† 160... Smyrna			Calvisius refers to Pausanias in Arcad.
† 169, or 177... Parts of Germany			v. Hoff, vol. ii. p. 146.
† 176, or 177... Smyrna			Bernhertz, p. 51.
† 223. (On the 9th and 17th of December, according to Calvisius).		Accompanied by an eclipse	Eusebius, p. 293.
† 262... Rome, Libya, and Asia Minor.	Many cities inundated by the sea		Calvisius quotes Fasti Sic.
† 262... Japan	Many shocks at various periods from 200.	Attended by an eclipse. The earth opened in many places and salt water gushed out: dreadful subterranean noises heard.	Trebellius Pollio in Gallien, ii. c. 5. Calvisius.
† 272... Syria		Tyre and Sidon greatly injured	Kämpfer (v. Dohm), i. p. 197.
† 272... Opus, in Greece			Orosius, lib. vii. c. 25.
† 272... Arcopolis, on the Dead Sea.			v. Hoff, vol. ii. p. 174.
† 272... K. Ritter's Erdbeschreibung, vol. ii. p. 239.			



3.	4.	5.
d	Twelve towns destroyed	Sigonius, lib. iii. p. 122.
Very many and violent shocks.	The shocks began this year and were continued the next.	Baglivi, p. 542.
at An-Ditto		Lycosthenes; Baronius, t. iii. p. 536.
East	Many cities overturned	Calvisius. Socrates, lib. ii. c. 10.
	The city ruined	Chron. Eusebii, lib. post. p. 182.
Lasted three days at Rome.	The dates for the three or four years immediately preceding appear to be very uncertain, several authors differing in them alightly.	Lycosthenes and Frytschius.
ides, Dyr- and twelve Campania; mc.		Sigonius, i. lib. v. p. 169; Frytschius.
Syria		Sigonius, loc. cit. p. 170; Cedrenus.
er, Bithynia.		Sigonius, loc. cit. p. 178; Agathias de reb. Just. p. 51.
edonia.		Sigonius, p. 204; Muratori, Annali, t. ii. p. 392.
in Bithynia		Chronicon Paschale, p. 293; Eusebius, p. 185.
and Nicea		Sigonius, p. 227; Baronius, t. iv. p. 117.
ople		Sigonius, p. 228.
Asia Minor;	The sea retired, and then flowed in again with violence, doing great damage.	Baronius, p. 187; Sigonius, p. 236; Calvisius.
ocks		Frytschius.
		Chronicon Paschale, p. 301; Sigonius, p. 249; Calvisius.
		Baronius, t. iv. p. 211.

+ 372	Nicea	.....	.....	.....	This date is by no means well fixed, authors varying from 367 to 379.	Gautier, p. 309; Frytchius.
+ 382	Constantinople and Rome.	.....	.....	.....	.....	Evagrius; Baglivi.
394.	From Throughout Europe	.....	.....	.....	.....	Marcellinus Comes, p. 37.
395.	Sept. to Nov.	.....	.....	.....	.....	Signonius, p. 345; Baronius, p. 706.
+ 396	Jan. following.	.....	.....	.....	.....	Signonius, p. 355.
	Principally at Constantinople.	.....	Violent shocks for several days.	.....	Marcellinus Comes mentions, as occurring at the same time, an appearance in the heavens as if they were on fire (probably an aurora—Perrey).	Baronius, t. v. p. 178.
+ 403.	During the night.	.....	.....	.....	.....	Chronicon Paschale, p. 308.
+ 407.	April 1 Place not mentioned; (mense Xanthico), probably Constantinople.	.....	.....	.....	.....	.....
408	Rome	.....	.....	.....	Subterranean noises heard for seven days	Signonius, p. 393; Marcellinus Comes.
—	Utica	.....	.....	.....	Ditto. Perhaps confounded with the last	Prosperi Tyronis Chron.; Dom Bonquet, t. i. p. 637.
+ 417.	April 20 Probably Constantinople; also Kybera in Asia Minor.	.....	.....	.....	.....	Chron. Pasch. p. 310; Marcellinus Comes.
+ 419	Palestine	.....	.....	.....	Many towns and villages destroyed	Marcellinus Comes, p. 38.
+ 422.	April 7; Constantinople?	.....	.....	.....	In the same year a comet appeared	Chronicon Paschale, p. 343.
+ 423.	April 7; Constantinople?	.....	Many shocks	.....	.....	Ditto.
+ 424.	10 o'clock A.M. or P.M.?	.....	.....	.....	.....	.....
—	"In multis locis" Constantinople	.....	.....	.....	Fifty-seven towers thrown down; v. Hoff places this earthquake in the year 447.	Marcellinus Comes.
+ 427	Place not mentioned	.....	.....	.....	.....	Marcellinus Comes, p. 41.
431.	June 20; Constantinople	.....	.....	.....	.....	Baronius, p. 622.
+ 431.	Hour of the night.	.....	.....	.....	Violent shocks lasting for four months.	Anciennes Révolutions du Globe.
434	Rome	.....	.....	.....	Buildings thrown down	Baronius, t. vi. p. 12.
434	Constantinople	.....	.....	.....	Shocks lasting for four months	Hist. Rerum Germanicarum, Schard. t. 70.
441	Throughout most of the civilized world.	.....	.....	.....	Lasting six months.	Baronius, t. vi. p. 37; Christ. Math. Theat. Hist. p. 377.
445	.....	.....	.....	.....	.....	.....
446	.....	.....	.....	.....	.....	.....



+ 522	Corinth and Dyrrachium					Cedrenus, t. i. p. 364.
+ 524, or 525	Anazarbus in Cilicia					Cedrenus, p. 365.
+ 525.	May 29. Antioch; also felt at noon. Constantinople.					Cedrenus, p. 365; Sigonius, loc. cit. p. 629; Eragrius, &c.
+ 528.	Nov. 29. Antioch					Cedrenus, p. 368; Sigonius, p. 634, &c.
+ 533.	Nov. In Constantinople the evening.					Chronicon Paschale, p. 341.
+ 536	Pompeopolis in Mysia					Theoph. p. 183; Anastasius, p. 62.
+ 542.	Aug. 16 Constantinople					Theophaues, p. 188.
+ 543.	Sept. 6... Throughout the then known world.					Cedrenus, p. 371. Theophaues gives the year after.
+ 546	Constantinople					Anastasius, p. 64; Procopius, Lycosthenes.
+ 547	Byzantium and other localities.					Frytschius, Lycosthenes.
+ 548.	Especially in Feb. About 549					Theophaues, p. 191; Cedrenus, p. 375, &c.
+ 550,	or 551. Palestine, Arabia, Mesopotamia, Syria and Phœnicia; also in Greece.					Greg. Turon.; Dom. Bouquet, t. iii. p. 410.
+ 552	of 555. Constantinople, and many other parts of the world, even extending to part of Egypt.					Theophaues, p. 192; Cedrenus, p. 376, &c.
+ 553.	July 11 Constantinople					Procopius, quoted by Calvinius.
+ 554.	April 2 Ditto					Cedrenus, p. 384; Baronius, t. vii. p. 474; Anastasius; Agathias.
+ 556.	Oct. 6... Many shocks					Theophaues, pp. 195, 196; Cedrenus, p. 385; Baronius, &c.
+ 557.	Dec. 14 Ditto, and at Antioch and other cities; also at Rome.					Ditto.



1.	2.	3.	4.	5.	6.
558 (May 3, according to Pogg. Ann. t. lvi. p. 650).	Constantinople	Shocks still continuing			Cedreus, p. 386.
560, Dec. (24 according to Pogg. Ann. quoted above).	Ditto			A conflagration and a pestilence in the same year.	Theophanes, p. 199; Cedreus, p. 387, &c.
562, or 563...	Berytus and in the island of Cos.				Fryschius; Marmont, Voyage en Hongrie, t. ii. p. 259.
577	A mountain on the banks of the Rhone; according to v. Hoff, the Dent du Midi in the Valais.			The mountain gave forth a subterranean noise like bellowing for some days, and then fell with houses, men, &c. upon it, into the stream below.	Matthew of Westminster, lib. i. p. 195; Gregor. Turon. lib. vi. c. 31; Fryschius, &c.
579. At noon	Chinon			The church trembled during the celebration of the service.	Dom. Bouquet, t. ii. p. 242.
579, or 580...	Antioch and Daphne			In the Pyrenees great stones were rolled down from the mountains.	Baronius, p. 626; Evagrius.
582	Bordeaux and in the Pyrenees.			Subterranean commotions	Dom Bouquet, t. ii. pp. 252 and 409. t. iii. pp. 83 and 227.
583	Soissons and Angers				Ditto, t. ii. p. 277 t. iii. pp. 88 and 234.
584 (Dec.?)	Constantinople?				Theophan. p. 213; Cedren. p. 394.
586	Angers				Dom Bouquet, t. ii. p. 297. t. iii. p. 243.
587. Sept. 30, 3 hours after twilight.	Rome				Baglivi, p. 542.
589, Oct. 21	Antioch				Baronius, p. 699; Ch. Mathias, p. 426.
599, at nine in the evening according.	Ditto				Mémoires de Chronologie, t. ii. p. 909; Evagrius, lib. vi. c. 8.

600. June 14, at dawn.	Place not mentioned; probably in France.						Dom Bouquet, t. ii. p. 379.
600	Japan. Extended throughout the whole empire.						Kämpfer, v. Dohm, vol. ii. p. 204.
611. April 20, at the 7th hour.	Constantinople?						Chronicon Paschale, p. 383.
615. August.	Throughout Italy						Followed by a dreadful pestilence. The date somewhat uncertain.
631, or 632.	Palestine and Arabia	The shocks lasted thirty days.					Signonius, De Regno Italie, t. ii. p. 86; Benth; Bernherz, &c.
639. About 3rd hour of night.	Antioch						Simon Schard, f. 89; Ch. Mathias, p. 440, &c.
640	Arabia, particularly Medina and the neighbourhood.						Accompanied by a dreadful noise . . . . . Lycosthenes.
650	Medina						K. Ritter, Erdkunde, vol. ii. p. 339.
658. June.	Palestine and Syria.						Followed by apparently the breaking out of a small volcano.
677	Constantinople						Great damage done.
678, or 680.	Mesopotamia						Theophanes, p. 288. Collection Académique.
684, or 685.	The Japanese province of Toa, which is the south-western portion of the island Sikokf.						Theophanes, p. 296; Anastasius, p. 112; Centurie Magdeburgenses, t. ii. p. 312.
Beginning of the 8th century.	Valley of Egecik in the Caucasus.						More than 500,000 acres of land sank into the sea.
707?	Italy						Kämpfer, v. Dohm, vol. i. p. 207; v. Humboldt, Fragmens Asiatiques, t. i. p. 224.
713. Feb. 28.	Syria						Description d'Edchmiadin par l'Eveque Chakhathouno, t. ii. p. 18 (in Armenian).
718.	Syria						Vite de' Duchi di Venezia, Muratori, t. xxii. p. 446.
							Theophanes, p. 320; Anastasius, p. 125.
							Theophanes, p. 334; Anastasius, p. 125.

1.	2.	3.	4.	5.	6.
746. Jan. 18, 4th hour.	Syria and Palestine, especially round Jerusalem.			Great damage done, both to buildings and life...	Theophanes, p. 354 ; Cedrenus, p. 462 ; Anastasius, p. 143 ; Baronius, p. 184.
749 (Jan.?)	Syria and Mesopotamia			Parts of the hills thrown down. A chasm opened in the earth of more than 1000 paces long. The date somewhat uncertain.	Theophanes, p. 357 ; Cedrenus, p. 463 ; Anastasius ; Baronius, &c.
757. March 9.	Syria and Palestine				Theophanes, p. 361 ; Anastasius, p. 146 ; Centuriæ Magdeburg. p. 491. v. Hoff, vol. ii. p. 173.
775	Antioch			Buildings thrown down; forty-eight people killed.	Dom Bouquet, t. v. p. 70.
778	Italy, at Trevisa, &c.				Beuther quotes Avent. Annal. lib. iii. in fine.
786. In the latter months of the year.	Germany. Principally in Bavaria.				
789. Feb. 9.	Constantinople				Theophanes, p. 392 ; Cedrenus, p. 471 ; Anastasius, p. 162, &c.
794	Rome				Baglivi, p. 542.
795, or 797. Apr. During the night.	Alexandria in Egypt			The Pharos overturned	Hadschi Chalifa.
— May, 4	Island of Crete				Theophanes, p. 397 ; Anastasius, p. 165.
—	Constantinople. (Either this or the last also felt in Sicily, according to v. Hoff.)				Ditto.
801. Apr. 25, or 30 ; 2nd hour of the night (v. Hoff gives the date	France, Germany, Italy, and on the Rhine.			Many buildings in Italy thrown down. Amongst others the basilica of St. Paul at Rome. It does not seem certain that the shocks happened on the same day or even month in Italy as in Germany, France, &c.	Dom Bouquet, pp. 24, 365 ; Collection de Duchêne ; Simon Schard ; Hondorf, Annal. Francorum, &c.



1.	2.	3.	4.	5.	6.
844 .....	Different parts of Italy	Many and violent shocks.			v. Hoff, vol. ii. p. 202.
847. June ...	Country between Rome and Beneventum.				Sigonius, p. 301; Baronius, t. x. p. 53; Christ. Mathias, p. 498, &c.
849. Feb. 17. 10th hour of the night.	Through Gaul; also at Auge (now Richenaw) near Constance, in Switzerland.				Dom Bouquet, t. vii. pp. 65, 207, 235 and 272.
855. Jan. 1	Mayence; also at Worms	Twenty shocks		Accompanied by thunder, lightning, hail, &c.	Simon Schard, fol. 109; Dom Bouquet, t. vii. pp. 217 and 233; Duchêne, t. ii. p. 553.
856. Dec. 13	Japan	Many violent shocks		Chasms opened in many places in the mountains and rocks.	Kämpfer, v. Dohm, vol. i. p. 213. Martene et Durand, t. v. p. 271.
—	Bale			Accompanied by violent storms of wind	Hadachi Chalifa; El Makin, p. 150; D'Herbelot, Bibl. Orient.
—	Persia, Khorasan, Syria, Arabia; and especially at Kumis, Rai, and Hamadan.				
858. Jan. 1	Many countries and towns, but especially at Mayence.	Many violent shocks			Dom Bouquet, t. vii. p. 166; Duchêne, t. ii. p. 554.
— Dec. 25	Ditto	Many and violent shocks by night and day.			Dom Bouquet, t. vii. p. 73.
— (About winter?)	Constantinople	Violent shocks			Cedrenus, p. 552.
—	Switzerland				Bertrand, p. 29.
859 .....	Mayence	Many shocks		Followed, the next year, by a very severe winter. This earthquake is probably confounded with the one in 858.	Dom Bouquet, t. vii. p. 234.
—	Antioch, Laodicea, and other towns of Syria.			More than 1500 houses thrown down at Antioch. A part of the mountain Askraos near Laodicea	Hadachi Chalifa; Abulfaradsch, p. 166; El Makin, p. 190.

ON THE FACTS OF EARTHQUAKE PHENOMENA.

861. Aug. ...	Constantinople	Shocks lasting for forty days.	One of the mountains of the Rhine was closed.	Baronius, t. x. p. 198.
862. May 23	Constantinople, and in the provinces of Bagdad.		Other authors give the dates 855 and 860	El Makin; Purchas; Chr. Mathias; Zouara, p. 162; Baronius, p. 213.
863	Neighbourhood of Erivan.	Very violent	Did immense damage to buildings and life	Mkhitor d'Ani, Chakathouno, &c. cit.
867. Jan. 9	Constantinople	Shocks for forty days and forty nights.		Leonis, Grammat. Chronog. p. 470; Georgi Mon. novi Imper. p. 544.
Oct. 9	"Per plurima loca"			Dom Bouquet, t. vii. pp. 173, 208, 235 and 275.
867	Switzerland			Bertrand, p. 30; Schencher.
870. Dec. 3.	Neighbourhood of Mecca.		All the wells stopped flowing	Mémorial de Chronologie, t. ii. p. 910.
1st hour.	Mayence			Dom Bouquet, t. vii. pp. 176 and 236.
872. Dec. 3.	Ditto		Most probably confounded with the last-men- tioned earthquake.	Ditto. Lerner's Chronik von Frank- furt, &c.
1st hour.	Ditto		Accompanied by an eclipse of the sun	Ragor, Beuther, &c.
880. Jan. 1.	Ditto			Dom Bouquet, t. vii. pp. 41 and 246;
881. Dec. 30.	Ditto	Very violent		Collection Académique, Cent. Magdeb., &c.
Before the growing of the cock.				
885	Ditto		The church of St. Alban was overthrown. Pro- bably confounded with one of the other earth- quakes at the same place.	Münzenus in Chronographia; Cent. Mag.
887	Egypt	Very violent	Abulfaradsch mentions an earthquake in 883 El Makin. probably the same with this.	El Makin.
893	India		The capital (the name of this city is not given) was destroyed, and 180,000 men perished. Preceded by an eclipse of the sun, and fol- lowed by great storms. The same year white and black meteoric stones fell, accompanied by thunder and lightning.	Abulfaradsch, p. 178-80; El Makin.
894	Environs of Erivan; town of Doun.		20,000 persons lost their lives	Chakathouno; Michael Tchomtchian.
895	During In many regions of the council Western Frank.			Dom Bouquet, t. viii. p. 56.

1.	2.	3.	4.	
3, Jan. 9...	Rome ..... At Sens? "Circa cenobium S. Columbe Virginis."			The basilica of the Lateran .....
11	Rai and Thabrestan .....			..... Hadschi Chalifa. Collection Académique, Baglivi, <i>loc. cit.</i>
22	"In pago Cameracensi" (Cambresis). .....			Dom Bouquet, t. viii. p. 179; Duchêne, t. ii. p. 592.
929, or 930...	Thrace .....			Leon. Grammatici Chronol. p. 502; Hist. Byzantine, Combefisius, pp. 256, 486 and 582.
931	Japan .....	Very violent.		Kämpfer, v. Dohm, vol. i. p. 215. Centuriæ Magdeburgenses.
935. Jan....	Monastery of S. Colomba. At Sens? .....			Kämpfer, v. Dohm, <i>loc. cit.</i>
938	Japan .....			Dom Bouquet, t. viii. p. 251, and t. ix. p. 92; Cent. Magd.; Ragor.; Bertrand, &c.
944. Apr. 16.	Switzerland. (Other authors do not mention any place.) .....			Chronicon Hirsauense; Wittekind. Gesta Sax. lib. iii.; Sigeberti Chron., &c.
"Circa pullo- rum cantum." 950, or 951, or 952.	"Per multa Germaniæ et Gallie loca." .....	Several violent shocks		Ibn el Atsir in Abulfeda, Ann. ii. p. 467; Hadschi Chalifa; Bar Hebraeus; El Makin.
957	Rai and Thalekan .....		The (Caspian?) sea re- treated from its shores, disclosing new islands to view.	Abulfaradseh, p. 196; El Makin.
958	Deisan and Kascha in Persia, and the coun- try round.	More violent than that of the preceding year.		Marai. Geschichte der Regenten v. Ägypten. überetzt v. Reiske in Büsching's Magazin, t. v. p. 369.
965, or 967...	Egypt .....			Cedrenus, p. 660; Zonaras, p. 206; Léon Diacre, p. 41.
Sept. 2.	In Paphlagonia, Hono- ria, and Claudiopolis.	Very violent Three shocks during		Baronius, p. 796.
				Bernherz; Collection Académique. Simon Denchevski; Collection

859.	In the evening.	Capua and Beneventum			Others give the date 983, and others that of 997, saying that it was accompanied by an aurora. An eruption of Veuivius took place in 983.	Leon D'Anate, p. 109.
† 985.	Sept. 23.	Cyzicum, Nicea, and other places.			Beuther quotes Feucer in exposit. 3. part. Chron. Carion.	
†	—	Laybach in Carniola			Collection Académique.	
† 986.	October.	Constantinople; also felt all through Greece.			Cedrenus, p. 696; Michael Glycas, p. 309; Baronius, p. 843; Ch. Mathias, p. 554.	
990	—	Beneventum and Capua			Muratori, t. vii. p. 164.	
991	—	Borgo S. Sepolcro			Sarti, su i terremoti, cap. 3.	
992.	Aug.	Damascus		Shocks did not cease until the 14th day of the following month (Saphar).	Vattier, Vie des 49 chalis par Le Macine, p. 262.	
996.	Aug.	Place not mentioned			Philippi Bergomat. Suppl. Chron. fol. 286.	
997	—	Egypt		Very violent	El Makin.	
—	—	Magdeburg		Several shocks.	Beuther quotes Fabricius.	
999.	Dec. 14.	Place not mentioned			Beuther quotes Nacler; Curio; Collection Académique; Cent. Magd.	
1000.	Mar. 29.	Throughout Europe. No particular place mentioned.			Almost all the chronicles of the time.	
—	—	Poland.				
—	—	Rome			Gazette de France, 14th April 1785; Gentleman's Mag. vol. lvi. p. 175.	
—	—	Switzerland			Baglivi, loc. cit.	
1001 of 1005.	—	Campania		Lasted fifteen days	Bertrand, Coll. Académique, p. 516.	
1004.	—	—			Signonius, p. 474.	
1005.	Jan. to Rome	—		Shocks during the time mentioned.	Collection Académique, Baglivi, loc. cit.	
1006.	March	Deinar in Irak			Hadschi Chalifa; Abulfaradsch, p. 219.	
1007	—	—				
6001	—	"Lisbon, and the countries of the south."			Collection Académique; Mémorial de Chronol. t. ii. p. 911.	



1.	2.	3.	4.	5.	
1010. Jan. to March 9. On this day (9th March) at the 10th hour.	Constantinople	Very many and violent shocks. The principal one on the 9th March.		Accompanied on the 9th March by a terrible noise. Baronius gives the date 1011.	Cedrenus, p. 706; Michael Glycas, p. 310.
1012	Place not mentioned				Beuther quotes Sabellicus and Nauclerus.
1013, or 1014. Sept. 18 and Nov. 18. On the first occasion about midday.	Place not mentioned. The one of the 18th September probably felt at Liège.			Some uncertainty as to the date	Chron. Leodienense, Labbe, t. i. p. 337; Chron. Magdeburg; Dom Bouquet, t. x. pp. 218 and 321.
1016	Poland				
1017	Rome				Gazette de France, April 14, 1786; Gentleman's Mag. vol. lvi. p. 175. Collection Académique.
1021. May 12.	Lisbon				Mémoires de Chronol. t. ii. p. 911.
	Many parts of southern Germany, especially in Bavaria; and at Bâle.			The wells all through Switzerland were troubled, and the water in many became red like blood. Great inundations were produced in many places. Ignceous meteors were observed. Some authors (as Chron. Alberti) give the date 12th May 1020.	Bertrand; Schenker; Collection Académique; Bernhart quoting Aretius; Dom Bouquet, t. x. p. 193; Simon Schard, &c.
1029	Damascus			Half the city was ruined	El Makin.
1031. Aug. 13. hour of	Constantinople			v. Hoff gives the date 1032	Cedrenus, p. 730.
				v. Hoff gives the date 1033, or 1034	Cedrenus; also Abulfaradsch, p. 233.



1.	2.	3.	4.	
1058 ..... 1059 ..... 1060. April 7 ..... 1061 (Easter-day) .....	Mesopotamia and Mosul ..... Germany ..... Brescia ..... In the East, probably, but no place is mentioned.	Lasted an hour ..... Several shocks .....	Great damage done both to buildings .....	Sigonius, p. .... El Makin.
1062. Feb. 8. ....	Bâle, Constance, Neuf- chatel, and other parts of Switzerland.	.....	Accompanied at Neufchatel and Constance by thunder and lightning.	Stumpffius; Hermannus Contractus; Bertrand; Cent. Mag.; Lyco- athenes; Dom Bouquet, t. xi. p. 22.
1063 .....	Syria, especially at Tri- poli.	Very violent .....	The walls of Tripoli thrown down .....	Abulfeda, li.
1064. Sept. .... 23. About the second watch of the night.	In Thrace, especially at Constantinople; and also in Asia Minor, particularly at Cyzicus and Nicea.	Exceedingly violent. The shocks were fre- quently repeated for two years, and ap- peared to proceed from the west.	.....	Joann. Scylitzæ Curopal, Breviar. Histor. p. 816, Paris edition; Zonaras, p. 274; Glycas, p. 325, &c.
1065. Mar. 27 ..... (Easter-day). 1069 .....	In Germany ..... Syria, especially at Ram- la, in the south-west of Palestine; also in Egypt.	..... The sea retired from the coast, leaving the shore dry, and then returned with such vehemence as to inundate the country.	..... Many persons lost their lives.....	Calvisius. Hadschi Chalifa; El Makin; Abul- feda.
1070. May 11. .... 26. Throughout all England	Cologne and the country round ..... .....	..... ..... shocks .....	..... Accompanied by subterranean noise..... ..... The frosts were very severe from November to April.	Beuther quotes Chron. Univers. Matthew of Westminster, lib. ii. p. 6; Collection Académique; Dom Bouquet, &c. Ditto. Ditto.

DATE	QUOTED	RECORDS	IN	CHARACTER
1081. Mar. 27, 1st hour of the night.	Throughout England; and also in Germany, especially at Mayence, and in Carniola.	Spain	Shocks lasting for many weeks.	Accompanied by subterranean noise. The date appears doubtful as respects Germany.
1082. or 83 (?) Dec. 6.	Constantinople			
1083. Mar. 21.	Angers			Many houses and churches thrown down.
Oct. 18 (Day of St. Luke).	Probably in central France. (In Poitou and Limousin?)			The second chronicle of St. Albin d'Angers gives the date 1082.
1085	Different parts of Europe. Possibly in Lorraine.			A church is said to have been burned. Qu. by volcanic fire?
1086. In the evening.	In the Sicily; especially at Syracuse.			Followed by great cold. Probably confounded with one of the preceding earthquakes.
1087. July 14.	Soissons			A great pestilence is said to have prevailed in the western part of Lorraine, and this occurrence is coupled with the earthquake in an ambiguous sentence, from which one cannot distinctly learn whether the latter was felt there or not. Followed the next year by great floods.
1088. May 12.	Thuringia and Hesse			At Syracuse a church fell at the time of vespers, and killed many people. Others give the dates 1070 and 1100.
1089. Aug. 10.	Throughout the Terra di Bari.			"Cum aeris concussione"
1090. Aug. 10.	Throughout la Puglia in Italy. Place not mentioned. Probably in the East.			Hermannus Gigas; Naucleus; Platin.
1091. Aug. 10.	Thuringia and Hesse			Baronius, t. ix. p. 587; Trithemii Chron. p. 176.
1092. Aug. 10.	Thuringia and Hesse			Romualdi Salernitanii Chron. t. vii. p. 176.
1093. Aug. 10.	Thuringia and Hesse			Abulfeda, Ann. iii. p. 267.
1094. Aug. 10.	Thuringia and Hesse			Fabricius; Rivander, Düringische Chron. p. 210.
1095. Aug. 10.	Thuringia and Hesse			Anonymi Barenais Chron. t. v. p. 154.

Polon. lib. ii. c. 20.

Matthew Paris, t. i. p. 11; Matthew of Westminster, lib. ii. p. 8; Dom Bouquet; Simon Schard; Polydore Virgil; Beuther quoting Siebertus and Masseus; Collection Académique, and many other chronicles.

Die Mauren in Spanien Conde, übersezt v. Rutschmann, B. ii. p. 61.

Glycas, p. 333; Zonaras, p. 299; Cent. Magdeb. t. iii. p. 367.

Dom Bouquet, t. xii. p. 479.

Chron. S. Maxentii, Dom. Bouquet, t. xii. p. 402.

Lycosthenes.

Chron. Hirsang., Chron. Turon., Dom Bouquet, t. xii. p. 465.

Hermannus Gigas; Naucleus; Platin.

Baronius, t. ix. p. 587; Trithemii Chron. p. 176.

Romualdi Salernitanii Chron. t. vii. p. 176.

Abulfeda, Ann. iii. p. 267.

Fabricius; Rivander, Düringische Chron. p. 210.

Anonymi Barenais Chron. t. v. p. 154.

2.	3.	4.	5.
4. Throughout la Puglia in Italy.			Houses were seen to leap upwards and return to their position. There was a great scarcity of fruits this year, and the harvest was not got in until the 30th November.
g. 11. Throughout all England for of ght.			Probably the same with the last Accompanied by great thunder and lightning. Great stones were thrown from the arches of the windows of the large tower of the church.
England			
Nov. 2. Angers			Eberus in Calendario.
Feb. 8. Constance and the shores of the lake of same name.			Atteda, Ann. iii.
Antioch and Damascus			Simon Schard; Chron. Hirsang.
Sept. 10. Place not mentioned.			Cent. Magd.; Dom Bouquet,
iddle of			t. xiii. p. 714.
6? Sept. Venice			Vite de' Duchi di Venezia, Muratori,
he night.			t. xxii. p. 479.
iddle of			
97. Oct. 13. Place not mentioned.			Chron. S. Maxentii; Dom Bouquet,
Central France?			t. xi. p. 403; Labbe, t. i. p. 214.
98. Sept. 26. Ditto			Dom Bouquet, t. xii. pp. 403 and
			484; Labbe, t. xv. pp. 215 and
			481; Chron. S. Maxentii.
Oct. 5. Ditto			Ditto.
6. Ditto			Ditto.
at watch of			
he night.			
Bale			Berglaus in v. Hoff's Chronik.
Nov. 3. England			Roger de Hoveden in <i>Norman Anglie</i> .
			Script. fol. 288.
			Basili, p. 542.
			Edinburgh Encyclopedia, Article
			Chronology, without quoting any
			authority.
			Chronicon Patensium, Muratori, t. ii.
			p. 398.

1108. Dec. 24 Jerusalem	Probably Island of Malamocco the 40th, or 60th day after the 28th Jan.	The island was engulfed by the sea during an earthquake.	Muratori does not mention the earthquake, and gives the date 1106.	Lycosthenes; Simon Schard, p. 132; Cent. Magd.; Muratori, &c. Sigonius, p. 609; Muratori, Annali d'Italia, t. vi. p. 351; Vite de' Duchi, &c., p. 483 and 486.
1106. May 4. Angers?	Ely in England.			Gentleman's Magazine, vol. for 1750, p. 56.
In the morning.				Dom Bouquet, t. xii. p. 486.
About 1107.	In Italy. Exact place not mentioned.		Houses and even hills thrown down.	J. Malvecii Chron. loc. cit. p. 874.
1109. Antioch			The earth opened and houses were swallowed up.	Frytschius.
1110. From Shrewsbury and Nottingham in England. morning to evening.			The river Trent stopped for a mile in length, so that it could be passed with dry feet. This continued from morning until the third hour of the day.	Simeon Dunelmensis, Hist. X. Script. col. 251; apud Salopiam Chron. Henrici de Knyghton, X. Script. col. 2379.
1112. Jan. 3. Southern Germany; especially Rothenburg on the Neckar.	Lombardy	Shocks for forty days.	The town of Rothenburg was overthrown; Liège also was inundated by the waters of the Meuse.	Martène et Durand, t. v. p. 805. Lycosthenes; Frytschius; Collection Académique; Centurie Magdebургenses; Münsterus, Cosmog., lib. iii. Dom Bouquet, t. xii. p. 557.
4. "In partibus Britannie." Query in England or in Britany.				Jean de Ferreras, Histoire d'Espagne, t. iii. p. 324.
1113. April 2. Toledo	Italy; at a place called Villa Magnera.			Labbe, t. ii. p. 218.
	Jerusalem	Two earthquakes during the year.		Muratori, t. vii. p. 590.
1114. All Syria, and part of Asia Minor.				Ch. Mathias, p. 587; Cent. Magdeb. t. xii. p. 863; Muratori, t. xxii. p. 484.
	Antioch and the country round.	Two separate earthquakes.	Tralesch, Mariscum, Manistria, and other towns were destroyed wholly or in part.	Purchas, Pilgrimes, vol. ii. p. 1208; Collection Académique; Muratori, t. xii. p. 591.
About Syria			Aleppo, Samosate, Jerusalem, Antioch, Haran, Bar Hebraeus, p. 298; El Makin; and Balasch were greatly injured. Possibly the same with the last.	Muratori; Ch. Mathias, &c.
1115. Dec. 25.				

1.	2.	3.	4.	5.
.....	Sumatra and Java .....	.....	.....	These two islands, which before were one, experienced a violent earthquake, by which they were separated, and the Strait of Sunda formed. Accompanied in some places by thunder and lightning. The fact of there having been a great earthquake about this time is confirmed by almost all the chronicles, but they differ considerably from one another as to date and attendant circumstances.
7. Jan. 3.	Upper Italy, Southern Germany, Switzerland, and Lisbon in Portugal.	According to some authors, lasted forty days.	.....	Bernherz; Ragor; Bertrand; Collection Académique, and almost all the old chronicles.
— May 3.	Liège .....	.....	.....	Chronicle of Siegbert.
— About December 1.	Lombardy .....	The shocks appear to have been very frequent about this time.	.....	Henrici Huntingdoniensis Hist. lib. vii.
— Middle of the night.	England? .....	.....	.....	Matthew of Westminster, lib. ii. p. 29.
— 30.	"En plusieurs lieux" .....	.....	.....	Dom Bouquet, t. xii. p. 276.
1118. June 4.	Italy .....	.....	.....	Chron. Veronense, Muratori, t. viii. p. 621.
—	Laybach and elsewhere in Carniola.	.....	.....	Collection Académique.
1119. Sept. 28.	Different parts of England.	.....	.....	Rerum Anglic. Script. fol. 272; Collection Académique; Simeon Dunelmensis.
3rd hour of the day.	.....	.....	.....	Chron. S. Monast. Cassin. p. 492; Frytachiuss.
1120. First watch of the night.	Monastery of Montecassino in Italy.	.....	.....	Cent. Magdeb.
.....	"In valle Tridentina" .....	Seven, ten, and even twenty shocks felt each day.	.....	Simon Schard, fol. 135; Dom Bouquet, t. xii. p. 782; Cent. Magd., &c.
.....	.....	.....	.....	Abulfeda, Ann. iii. p. 413.
.....	.....	.....	.....	Cod. Gothanus. No. 237.
.....	.....	.....	.....	The temple at Mecca was injured by the shock .....

1127	Tyre	fifteen days.	The earth opened, and many people perished. Others give the date 1128.	The Chronicles of Rabbi Joseph ben Joshua ben Meir the Sphadi, t. i. p. 97. Comm. to M. Perrey by M. Rossignol, Secretary to the Academy of Dijon. Baronius; Collection Académique.
1128	Switzerland and elsewhere.	Shocks lasting at intervals for forty days.		Bar Hebraeus, p. 308.
1129	Bagdad			Rapport de Vassali Bandi sur les tremblemens de terre du 2 Avril, 1808, p. 132.
1131	Laybach in Carniola			Mathew of Westminster, lib. ii. p. 34; Matthew Paris, vol. i. p. 72; Folydore Virgil, p. 255; Simeon Dunelmensis.
1133, Aug. 4.	In England	Very violent	Preceded by a very loud subterranean noise	Chron. Fosse Novæ, Muratori, t. vii. p. 869.
—	Cecano in the States of the church.		An eclipse of the sun is mentioned in connection with the earthquake; and as the former occurrence took place on the 2nd of August, the earthquake was probably simultaneous with the one last mentioned in England.	Anselmi Gemblæ: Appendix ad Sigebertum; Dom Bouquet, t. xiii. p. 270.
1134. Oct. 1.	The coasts of England and the Netherlands.	No land shock felt	The sea rose suddenly with such violence as to inundate the country, and retired to its usual level as suddenly.	Bar Hebraeus, p. 312.
1135	The city of Dogodoph in Armenia.	Violent shocks		Anonymi Casinensis Chron.; Muratori, t. v. p. 62 and 141.
June 5	Bagdad	Twenty shocks		Bar Hebraeus, p. 314.
1136.	Wurzburg			Beuther quotes Lycosthenes. Anonymi Casinensis Chron.; Muratori, t. v. p. 62 and 141.
—	Syria and Mesopotamia, especially at Aleppo.	At Aleppo the shocks lasted more than two months.		Abulfeda, Ann. iii. p. 479.



1.	2.	3.	4.	5.
9. Jan. 22. Beneventum t the first rowing of he cock.	In Hira, especially at the Persian town Gasana, and also at Aleppo and Ambar. Place not mentioned. Probably in Italy. In the neighbourhood of Kaluniku.	Three shocks during the same day.	The town Gasana was destroyed, 100,000 per- sons losing their lives. Black water came out of the earth at this place.	Hadechi Chalifa; Abulfeda, p. 329; El Makin; Bar Hebraeus, &c.  Cass. Chron.; Muratori, t. v. p. 64 and 141. Bar Hebraeus, p. 323.
140			No shock said to be felt. The earth opened and swallowed up forty horsemen, whose cries were heard long after (!).	
1142. Dec.	Lincoln	Three shocks during the same day.	This earthquake is not mentioned in the Rouen Chronicle.	Simeon Duncelmensis, Col. 268; Col- lection Acad. Breve Chron. Uticensis Comolai; Dom Bouquet, t. xii. p. 774. Baglivi, p. 543. Matthew Paris, t. ii. p. 634.
1143	Rome			Chron. Hirsingense; Balbi, Essai sur le Royaume de Portugal; Ber- trand; Cent. Magd.
About 1144	Paphos and several other islands in the Medi- terranean.			Casimirus Chron., Muratori, t. v. p. 66 and 142; Simon Schard; Lycosthenes; Cent. Magd.
1146	At Mayence. Also in Switzerland, Portugal (especially at Lisbon), and other parts of Europe.	At Mayence fifteen shocks were felt during one day and night. Great and numerous earthquakes.		A castle near Cluniscum was swallowed up, and a pool of water of great depth appeared in its place. Authors differ somewhat as to the date of the year. From being reported by the same author who men- tions the last, one would be led to suppose them different events; yet the circumstances are so
1151, or 1152	Italy			Ditto. Also Chron. Turon., Chron. Cluniscense, &c.
Feb. 15	In Burgundy	At Cluniscum it was felt three times du- ring the same night, times in one		

Year	Time	Place	Particulars	Persons lost their lives in Sicily	Persons killed	Other authorities
1157	(During Italy and Sicily winter).	Antioch, Damascus, and Tripoli.		5000 persons lost their lives in Sicily	2000 persons killed	Beuther quotes Vincent, lib. xix. c. 3; Chron. Martini Poloni; Fascic. temporum, &c. Ditto.
1158		Syria, &c.	At Malatia it was felt in the direction S. to N.		20,000 persons perished, and Antioch, Tripoli, Damascus, Aleppo, and many other towns were ruined. Other authorities give the dates 1159 and 1160.	Edinburgh Encyclopædia, Article Chronology.
1159		London and other parts of England.			The Thames dried up, so that it could be passed dryshod.	Bar Hebræus, p. 348; Nicetas Choniates; Cent. Magd., &c.
1160	Oct. 15	Sicily				Chron. Servasii Borbomeis; Coll. Académique; Révolutions du Globe.
1161	Jan. 1.	Village of Coutances in the territory of St. Lo in Normandy.				Mémoires de Chronol. t. ii. p. 911.
1162	At dawn.	16. Ceccano in Italy.				No ancient authority given.
1163	Aug. 2	Most probably in Anjou				Kämpfer, v. Dehan, t. i. p. 272.
1164	Jan. 25.	Southern part of Iceland.				Chron. Fosse Nove, Muratori, t. vii. p. 872.
1165	26.	At Norfolk and Suffolk.				Simon Schard, f. 147; Lycosthenes; Cent. Magd.
1166	27.	At Norfolk and Suffolk.				Chron. Fosse Nove, Muratori, t. vii. p. 872.
1167	28.	At Norfolk and Suffolk.				Voyage en Island, publié sous la direction de M. Gaimard, p. 313; v. Hoff.
1168	29.	At Norfolk and Suffolk.				Chroniques de Saumur et d'Angers; Dom. Bousquet, t. xii. p. 482; Martène et Durand, t. v. p. 1145; Labbe, t. i. p. 279.
1169	30.	At Norfolk and Suffolk.				Voyage en Island, p. 313; v. Hoff.
1170	31.	At Norfolk and Suffolk.				Matthew of Westminster, lib. ii. p. 47; Matthew Paris, t. i. p. 104.
1171	1.	At Norfolk and Suffolk.				Chron. S. Flaccus; Saumur, Dom. Bousquet, t. xii. p. 491; Martène et Durand, t. v. p. 1145.

1.	2.	3.	4.	5.	6.
1165. .... 1168. Jan. 10	South of Iceland At Pisa			Accompanied by considerable subterranean noise. From the 8th to the 20th the Arno was frozen over, so that horsemen could pass over the ice. Instead of "terremotus maximus cum mugitu," Muratori writes "tonitruius fortis cum mugitu." Hence perhaps this does not refer to an earthquake at all.	Voyage en Island, p. 313; v. Hoff. Bernardi Marangona vetus Chron. Pisanum, nell' Archivio storico Italiano, t. vi. part ii. p. 50.
1169. Feb. 4, or 5.	Sicily and part of Calabria.			Catania and other towns ruined, and 15,000 people killed. Others give the dates 1170, 1173, 1175, and even 1183. Doglioni reports it in 1166, and adds that it was felt in Greece.	Baronius, t. xii. p. 604; Muratori, t. vi. p. 588; Martène et Durand, &c.
— Feb. 18, or 20.	Toledo and other parts of Spain.				Mariana, Historiæ de rebus Hispaniæ libri xxx. lib. xi. c. 10; Jean de Ferreras, Histoire d'Espagne, t. iii. p. 483.
1170. May 9	Ceccano in Italy			The greater part of the walls of the town thrown down. The bells sounded of themselves for ten days.	Chron. Fosse Novæ, Muratori, t. vii. p. 874.
— June 29	In Syria. Also felt in Hungary, Germany, Switzerland, Sicily, and the north coast of Africa.	Recurring at intervals for fifteen days, or according to others for twenty-five.		Exceedingly violent. Great damage done to both life and property.	Hadschi Chalifa; Abulfeda; Robertus de Monte; Bar Hebreus; Dom Bouquet, t. xii. p. 345; and many other chronicles.
1172. Probably either Jan. 13, or July 7.	Place not mentioned. Probably near the monastery of Monte Cassino in Italy.			Accompanied by an eclipse of the moon. The latter phenomenon occurred this year on the two days mentioned.	Cassinensis Chron., Muratori, t. v. p. 69.
—	In the East. Probably Syria, or Asia Minor.				Collection Académique.
1173	Catania				Edinburgh Encyclopedia, Article Chronology.
1174. Aug. 17. At dinner hour (1).	Bologna?			Perhaps confounded with the great earthquake of 1169.	Chron. di Bologna, Muratori, t. xviii. p. 243.
1175 (or 1180). Aug. 1. In the watch of	Place not mentioned				Chron. Saxonium, Dom Bouquet, t. xiii. p. 723; Chron. Lamberti Parvi; Martène et Durand. t. v.

1180. About Sept. 29. 1180	About In England Naples	Two or three shocks	.....	.....	far that three new pools of water appeared where the ring had been.	Simon Schard, f. 163; Lycosthenes.
1182	In Switzerland	.....	.....	.....	The town of Arrian was swallowed up	Bertrand, 2 <sup>e</sup> Mém. p. 32; Mercure Hist. et Polit. t. xiv. p. 261.
1183	Syria and Judea. Switzerland Syria	.....	.....	.....	Followed by storms of wind and rain Very many buildings, &c. overthrown	Bertrand, p. 32. v. Hoff; Collection Académique. Bertrand, p. 32.
1184. Begin- ning of Jan.	Verona	.....	.....	.....	Antioch, Damascus, and Tripoli, all partly ruined. More than 20,000 victims. Possibly con- founded with one of the former earthquakes in the same country.	Muratori, t. ix. p. 178; Philipp Ber- gomat, Suppl. Chron. fol. 291.
— May 24	Calabria	.....	.....	.....	The exterior of the amphitheatre thrown down. A Verona chronicle gives the date of this event 1183.	Muratori, t. vii. p. 47; Sigonius, pp. 826, 827.
1185. April 15, 16, or 17.	All England, especially at Lincoln.	.....	.....	.....	In March of this year Veuvinus threw forth ashes for several days.	Chron. Cassin., Muratori, t. v. p. 70.
—	In Italy	The author calls it in one place "non mo- dicus," and lower down "modicus."	.....	.....	The cathedral of Lincoln and many other build- ings were thrown down. Baker's English Chronicle gives the date 1180, April 25.	Dom Bouquet, t. xvii. p. 465, t. xviii. pp. 60, 188, 328; Martène et Du- rand; Rerum Anglic. Script., &c. Siccardi Chron., Muratori, t. vii. p. 602.
1186.	March In a country called Uce- ricum, or Uccetum in Gothia. According to another author, in Greece.	.....	.....	.....	Followed in April by an eclipse of the moon. The date should probably be 1185.	Chron. de St. Denis, Dom Bouquet, t. xviii. p. 362; Lycosthenes, &c.
Begin- ning (after from middle of the septem- ber)	Almost universal in Eu- rope; especially in England, Calabria, and Sicily. Verona	.....	.....	.....	In England houses were thrown down, and in Calabria and Sicily many towns ruined.	Matthew Paris, t. i. p. 144; Matthew of Westminster, lib. ii. p. 59; Collection Académique; Cent. Magd., &c.
1187	.....	.....	.....	.....	Perhaps only the same with the one in 1184	Chron. Gervasi Dorobernenais in Script. Col. X. 1505.

1.	2.	3.	4.	5.	6.
1189 .....	Rome .....	The shocks recurred for eighteen months after.		Great number of buildings thrown down .....	Baglivi, p. 543. Lycosthenes and Frytachius.
1196. May 4 .....	Village of Longaw in Bohemia.	The shocks lasted several days.		Others mention 1200 as the year in which this earthquake occurred. Very probably only the same with the last.	Cent. Magd. p. 877; Diarium Hist. p. 134.
1199. May 3. Noon .....	Poland. Also felt at Constantinople.			Persons were thrown from their feet in some places.	Ymagin, Hist. Radulfi de Diceto. Col. 709; Révolutions du Globe, &c.
— .....	In England; principally in Somersetshire.				Chron. Fosse Noire, Muratori, t. vii. p. 886.
1200 .....	Ceccano .....			Accompanied by noise .....	Rerum Anglic. Script. fol. 464.
1201. Jan. 9 .....	York and the neighbourhood.			Persons were thrown from their feet .....	Dom Bouquet, t. xvii. p. 660.
— May 22 .....	In the counties of Somerset (Suffolk?) and Norfolk.				
— About the 6th hour of the day .....					
— or 1202 .....	Syria, Palestine, Mesopotamia, &c. Also felt in Cyprus.			Many towns greatly injured. Some authors (not Arabian) give the date 13th, or 20th, or 30th May 1202.	Hadechi Chalifa; Abulfeda, Ann. iv. p. 195; Bar Hebraeus, p. 435.
1202 .....	Different parts of England.				Dom Bouquet, t. xviii. p. 97.
1204 .....	Egypt, Syria, Mesopotamia, Irak, Asia Minor, Cyprus and Sicily.			The walls of Tyre thrown down .....	Abulfeda, Ann. iv. p. 211; Abulfetradach, p. 405.
— .....				The small island of Bali, which before formed part of the island of Java, was separated from it by this earthquake.	Raffles's History of Java, vol. i. p. 96, and vol. ii. p. 232.
1207. Feb. 26. Midnight .....	In Anjon? .....			Accompanied by loud peals of thunder .....	Addenda Chron. Andegav. S. Albini, Dom Bouquet, t. xviii. p. 327.
1208. June 13 .....	In Aquitaine .....				Dom Bouquet, t. xviii. p. 275.
— .....	In Nisabur and Choratan .....				Bar Hebraeus, p. 452.
— .....	Antioch .....				Cent. Magdeb. p. 680.
— .....				Buildings were thrown down .....	Cent. Magdeb; Sabellien, Decas l. lib. vii.
— .....					Cent. Magdeb. p. 680.

1214. Dec. 20. At night	In Normandy?	Three shocks			Chron. Mortui-Maris, Chron. Rotomag. Dom. Bouquet, t. xviii. pp. 356 and 361.
1215. Mar. 3. Midnight.	In Burgundy, or Limousin?				Chron. Cluniac. Cennobii, Dom Bouquet, t. xviii. p. 743.
1217. Jan. 8. At dinner	At Genoa.	Lasted a short time.			Caffari, Annales Genuenses, Muratori, t. vi. p. 412.
1218. hour (?). In winter.	In England.				Cent. Magdeh.
About 1218.	In Franche Comté			No shock felt, but a mountain opened and swallowed up 5000 men. Possibly not an earthquake. The dates given for this event vary very much.	Collection Académique, t. vi. p. 524, quoting Naclerus.
1219	In England.				Reuther quotes Polydore lib. xvi. v. Hoff; Voyage en Island, p. 313.
—	In the southern part of Iceland.		Accompanied by a submarine eruption off the coast at Nias Repp.		
1221	In England.			Perhaps only the same with the last two earthquakes mentioned for this country. A comet seen at the same time.	Lycosthenes. Muratori, t. iv. p. 109.
1222. Aug. At dinner	Bologna				
hour.					
Dec. 25 (Italy, Lombardy, the Tyrol, Germany and Cyprus; especially at Cologne and Brescia.		Shocks during the time mentioned.			Trithemius, Chron. Hirsaugiense; Baronius; Sigonius; Dom Bouquet, &c.
to 1223, Jan. 11.					
1223. Apr. 21. Midnight.	Cremona, Brescia, &c. in Italy.	Many shocks.		A rain of sand of the colour of blood is also mentioned.	Ant. Campo, Hist. di Cremona, p. 46; Dom Bouquet, t. xviii. p. 116; Sigonius, p. 228.
1224. Nov. 15. 9 o'clock.	Barcelona				Chronol. Barcinon. Marca Hispanica, p. 755.
In Territory of the Salvi (now Pays d'Aix in the Département des Bouches du Rhône).				5000 persons killed by the masses of rock which fell from the mountains.	Lycosthenes, p. 433; Baronius, t. xiii. p. 272; Aventinus, &c.
1227. winter.					
July	Monte Mola in Italy			No shock mentioned, but the mountain is said to have fallen and killed 700 people. Perhaps only a landslide.	Richard de S. Germano Chron. Muratori, t. vii. p. 1004.
1228.					

1.	2.	3.	4.	5.	6.
1230. April 5.	Reggio in Calabria .....	.....	.....	From the 1st to the 15th March subterranean bellows (mugissements) had been heard throughout all Calabria.	G. Fiore, Calabria Illustrata, p. 286.
—	In Bohemia .....	.....	.....	At the same time part of Holland was inundated.	Ilist. Bohemica, lib. xv.; Rerum Bohemic. Fréher, p. 124.
1231. June 1.	Monastery of St. Germain. The earthquake extended from Capua to Rome.	The shocks continued at intervals for more than a month afterwards.	.....	The fountains were troubled, and the water remained salt for two hours, and exhaled a fetid odour.	Richardi de S. Germano Chron.; Muratori, t. vii. p. 1026; Baglivi, p. 542.
1233 .....	In Burgundy .....	.....	.....	.....	Fryschius.
1236 .....	Laybach in Carniola .....	.....	.....	Followed by a most abundant year .....	Vassali—Eandieur les Tremblemens de Terre du 2 Avril 1806, p. 132; Collection Académique.
1240 .....	Guldringe Syssel in Iceland.	.....	A submarine eruption at the same time near Reikia Näs.	.....	v. Hoff.
1242. Oct. 24.	Vicenza? .....	Very violent .....	.....	.....	Ant. Godi Chron., Muratori, t. viii. p. 86.
In the evening.	Lucca .....	Three earthquakes .....	.....	Buildings of various kinds thrown down .....	Annales Ptolomæi Luccensis, Muratori, t. xi. p. 1281.
1245 .....	Nardo (province of Otranto) in Italy.	.....	.....	.....	Chron. Neritimum, Muratori, t. xxiv. p. 897.
1246. June 1; 9th hour.	England, especially in Kent.	.....	.....	v. Hoff gives the 19th May as the day on which this earthquake took place.	Higden's Polychronica; Fabyan's Chronicle; Camden, &c.
—	Island of Candia .....	.....	.....	The walls of the town Canea thrown down .....	Petri Justiniani Hist. Venetor. lib. iii. Matthew Paris, t. ii. p. 723; Collection Académique, &c.
1247. Feb. 13.	Different parts of England, (especially London,) bordering on the Thames.	.....	.....	.....	.....
1248. Nov. 5	Naples .....	Very violent .....	.....	.....	Ephemerides Neapolitanæ, Muratori, t. vii. p. 1063.
—	Dec. 21. In England, in the diocese of Bath and Wells. Also felt in Piedmont and Savoy, and in Syria.	.....	.....	The Cathedral of Wells was much injured. It was remarked that the summits of the buildings were violently shaken, whilst their foundations were not.	Matthew Paris, t. ii. p. 756; Polydore Virgil, p. 397; Lycosthenes; Bertrand.
1249. Nov. 24. Midnight.	The abysses of Mians, half a league from Chambery.	.....	.....	No shock recorded. The mountain parted and one part fell, destroying a monastery at its foot, and many villages round. Perhaps only a headless.	De Saussure, Voyage dans les Alpes No. 1181. t. iii. p. 18, on the authority of a mineral at Mont St. Jean.

1253. Nov. 25. At night.	Chilterna (Hertford). Throughout the kingdom of Naples.	Terrible shocks for three days. The direction was nearly the same as that of 1158, viz. S. to N.	Extraordinary motion of the water of the rivers and lakes, which alternately inundated the country beyond their usual level, and retired considerably below the same.	Many thousand persons perished. A lake was formed in Natolia.	p. 803. Ephemerides Neapolitane, Muratori, t. vii. p. 1077. Collection Académique, t. vi. p. 526.
— In sun-mer.	Lombardy			No land-shock felt. There was no wind at the time.	Jacobi Malvecii Brixienae Chronicon, Muratori, t. xiv. p. 922.
1256. Sept.	Rome and Agnano			At Rome the bell of St. Sylvester sounded of itself.	D'Acheri, t. xi. p. 546; Duchêne, Histoire des Gaules, t. v. p. 362. Gentleman's Mag. vol. lviii. p. 175; Gazette de France of 14th April 1786.
1257	Poland				M. Croneri de reb. Polon. p. 159; Annales Silesiae, p. 82, &c. Kämpfer v. Dohm, p. 222.
1258	Ditto				Chron. Cavense, Muratori, t. vii. p. 928.
— Japan					Ditto.
Oct. 4 In Italy. Exact place not specified.					The small islands now called Giling and Travangan were separated by this earthquake from the northern side of the island of Java.
1259. Trapani in Italy					Raffles's History of Java, vol. i. p. 25; and vol. ii. p. 232.
— Java					v. Hoff; Voyage en Island, p. 313.
1260	The little island of Flatey in Breidafjord, Iceland.				J. Malvecii Chron., Muratori, t. xiv. p. 938.
— and 1261	Brescia			A comet visible at the same time	Ephem. Neapol., Muratori, t. vii. p. 1103.
1264 Apr. 10 Bari, in Italy				The date 21st March 1266 is also given, Palm Sunday being the day mentioned by the chronicler.	
1267.					



1.	2.	3.	4.	5.	
268. Night, between the 1st and 2nd Nov.	Modena, and elsewhere in Italy.				Annales veteres Mutinensium, t. xi. p. 70.
Nov. 3 or 4. Middle of the night.	Padua	Two great shocks			Regimina Padue, Muratori, t. viii. p. 379; Monachi Patavini Chron., Muratori, t. viii. p. 730.
	Kingdom of Naples, at the lake Celano.			This earthquake, and the last two probably took place at the same time, although the dates are not exactly concordant.	Leander and Albertus Bononiensis.
1273. Beginning of Mar.	In Cilicia—Durazzo	The movement was at first oscillatory, and afterwards appeared as if the surface of the earth were alternately contracted and dilated with great violence.		60,000 persons were killed. Preceded by subterranean noises for some time, which gradually increased in intensity up to the time of the earthquake.	Abulfaradsch, p. 572. Pachymeris Hist. i. lib. v. c. 7. pp. 242 and 537.
	Azerbidschan and Tabriz in Persia. Also in Thrace.				Bar Hebraeus, p. 548; Cent. Magd.
1274. Dec. 5	Throughout England			Accompanied by thunder and lightning, a comet, and a <i>fiery dragon</i> .	Matthew of Westminster, p. 363; Polydore Virgil, p. 414.
	Pays de Galles			Accompanied by a <i>rain of blood</i> .	Polydore Virgil, <i>loc. cit.</i> ; Fascio- temporum.
1275. Sept. 11. Between the 1st and 3rd hours of the day.	In England			Many of the most famous churches of England thrown down or injured; among others that of St. Michel-du-Mont near Glaston.	Matthew of Westminster, p. 364.
	S. Damiano in Pied-				Chron. Astense, Muratori, t. xi. p. 163.
					Caffari, Annales Genuenses, Muratori, t. vi. p. 566.
				The walls and other buildings were thrown down,	Bar Hebraeus, p. 553.

1278. 24.	Italy. April Venice, and almost all the rest of Italy.	Very violent. Recurred again on the 30th.	Other authorities place this event in 1279, giving the same days and month, while others again mention it on the 1st of May.	casu, saggio su congettura su terremoti, c. 3. Andreae Danduli Chron., Muratori, t. xii. p. 397; Vite de' Duchi di Venezia, p. 571. Polydore Virgil, lib. xvi.
1280	In France and England The island Sumbava near Java.		The little island Selo Parang was produced by this earthquake, being separated by it from the island of Sumbava.	Raffles's History of Java, vol. i. p. 25, and vol. ii. p. 232.
1282. Jan. 17. Hour of ves- pers.	At Venice		The date 1283 is also given	Vite de' Duchi di Venezia, p. 574.
—	Gap in Dauphiny			v. Zach, Correspondance Astro- nomique, t. vi. p. 32.
1283. Easter.	In the neighbourhood of Naples. At Mtakitha in the Caucasus.	The earthquake began on Thursday, recurred on Friday and Saturday, and again occurred on Easter Sunday.	The cathedral of Mtakitha fell into ruins	Johann de Oppido; Cant. Magdeb. Philadelphine sur les tremblemens de terre dans le Caucase.
1284 1285. Dec. 13.	In England At Ferrara in Italy			Collection Académique. Chron. Estense, Muratori, t. xv. p. 339. Abulfaradsch.
—	In the East. Particular locality not specified; said to be widely extended.			
1286. before the 5th Oct.	Some in Brittany, especially at Vannes.	Lasted forty days. The shocks recurred at intervals for a year.		Maize, Histoire de Bretagne, t. i. col. 31.
1287 1289.	Rome "Per universam orbem terrarum." France Pistoia in Italy	Several shocks. Violent shocks, which continued a long time.		Cant. Magdeb. Ditto. Mémorial de Chron. t. ii. p. 912. Ann. Ptolomæi Luccensis, Muratori, t. xi. p. 1298.

1.	2.	3.	4.	5.	6
1290 .....	Nearly universal in Europe. Felt most violently in Iceland, Switzerland, and at Lisbon; especially at the last of these.	.....	.....	Probably all these earthquakes in various places did not occur at the same time of the year.	Bertrand; Collection Académique; Voyage en Island, &c.
1292 .....	Rome .....	.....	.....	.....	Baglivi, p. 542.
1293. July 10 .....	Borgo-S. Sepolcro .....	Many violent shocks.	.....	Accompanied by violent storms of wind .....	Sarti, c. 3.
— and 11. ....	Parma and Pistoia .....	At Pistoia they occurred for 24 days.	.....	.....	Chron. Parmense, Muratori, t. ix. p. 825.
— .....	In Spain .....	.....	.....	.....	Palassou, Nouveaux Mémoires sur les Pyrénées, Pau, 1823.
1294 .....	Iceland .....	.....	.....	An eruption of Hecla began at this time, and during the six following years the volcano was never altogether inactive.	v. Hoff.
1295. Sept. 4. ....	In the bishopric of Tours.	Probably lasted several days.	.....	In the Rhetic Alps fifteen castles were destroyed.	Epitome Mundi; Cent. Mag.; Lycosthenes; Diarium Hist.; Eberus.
About noon. ....	Also in the Rhetic Alps, and at Constance.	.....	.....	.....	Nicephori Gregoræ Hist. Byzant. lib. vi. c. 9. p. 124; Pachymeria, i. lib. v. c. 7. p. 158.
1296. June 1. ....	Constantinople .....	Several shocks .....	.....	.....	Matthew of Westminster, p. 412.
Middle of the night. ....	In England .....	.....	.....	.....	Giovanni Villani, lib. vii. c. 25, Muratori, t. xiii. p. 361; Martène et Durand; Labbe, &c.
1298. Jan. 5. ....	Spoleto, Reati, and Pistoia in Italy.	Shocks lasting for several days.	.....	Others give the dates 1295, and 1300 .....	Edinburgh Encyclopedia, Article Chronology.
— Nov. 30 .....	In Germany .....	.....	.....	.....	v. Humboldt, Asie Centrale, t. ii. p. 110.
1299 .....	Karakorum (Holin, or Khorin) in central Asia.	.....	.....	This place was destroyed .....	v. Hoff.
End of the 13th century. ....	Country around Mt. Hecla in Iceland.	.....	.....	Hecla had been in eruption for some time before.	Ant. Campo, Hist. di Cremona, p. 84.
1300. Dec. 28. ....	Throughout Italy .....	Many violent shocks.	.....	.....	Fragmenta Hist. Forojulianæ, Muratori, t. xxiv. p. 1208.
1301. June 11. ....	Place not mentioned.	Four shocks, at the hours mentioned.	.....	.....	
At dawn, about noon, after vesper, and about .....	Somewhere in Italy.	.....	.....	.....	

1301. Nov. 30	In Italy. Felt but slightly at Venice.					Vite de' Duchi di Venezia, loc. cit. p. 582. Collection Académique.
1302	At Rieti (Rieti?) in Italy.					
1303. Aug. 8.	Alexandria and Acre, throughout the Peloponnesus, Candia, and all the Adriatic Sea. Felt but little at Venice.				The walls of Hama and Alexandria were partly thrown down. Some other chroniclers give the dates 1302 and 1304.	Hadachi Chalifa; Abulfeda, v. p. 191; Vite de' Duchi di Venezia, loc. cit. p. 772.
—	In Poland					
1304. Oct. 23	In Italy. Exact place not mentioned. Probably felt at Ferrara and Placenza.					Gentleman's Magazine, vol. lvii. p. 175; Gazette de France, 14 Avril, 1786.
1306? Some time after the earthquake in Candia.	Rimini					Chron. Estense, Muratori, t. xv. p. 351; Chron. Placent., Muratori, t. xvi. p. 485.
1307. In the Japan 8th month.						Ricobaldi Ferrar Chron., Muratori, t. ix. p. 254.
1311	Laybach in Carinthia			Very violent		Kämpfer (v. Dohm), p. 229.
1316. Sept.	At St. Denis in France					Vassali—Eandi sur les tremblemens de terre du 2 Avril 1808, p. 132.
1317. Dec.	In Italy			Two shocks in twenty-four hours.		D'Acheri, Spicilegium, t. xi. p. 667.
1318. Sept.	At Cologne			Lasted a long time		Martène et Durand, t. v. p. 561.
—	Nov. 14. In England					Acta Trevir. Archiepisc.; Martène et Durand, t. v. p. 407.
1319	In the provinces of Ararat and Sini in Armenia.			Very violent		Thom. Walsingham, Hist. Angl.; Camden, Angl. Norm., p. 111; Collection Académique.
1320. Dec. and	Oct. Sienna in Italy			Shocks during several days and nights.		Dubois de Montpéroux, Voyages autour du Caucase, t. v. p. 287; Chakhathouno, t. ii. p. 19.
—	In England					Chron. Sanece, Muratori, t. xv. p. 62.
1321 May 25	Rome					Edinburgh Encyclopædia, article Chronology.
1322. June 1.	In Germany			Venice was inundated.		Baglivi, p. 542.
—				Exceedingly violent.		Lycosthenes; Diarium Hist. p. 158.



1253. Nov. 25. Throughout the kingdom of Naples.	Chiterna (Hertford).					p. 803.
1255. Begin. At Arzenjan, or Arzenjan, in the pascchalik of Siwas, district of Divrigki, Asia Minor.		Terrible shocks for three days. The direction was nearly the same as that of 1156, viz. S. to N.			Many thousand persons perished. A lake was formed in Natolia.	Ephemerides Neapolitane, Muratori, t. vii. p. 1077. Collection Académique, t. vi. p. 526.
— In summer.	Lombardy		Extraordinary motion of the water of the rivers and lakes, which alternately inundated the country beyond their usual level, and retired considerably below the same.	No land-shock felt. There was no wind at the time.		Jacobi Malvecii Brixianæ Chronicon, Muratori, t. xiv. p. 922.
1256. Sept.	Rome and Agnano			At Rome the bell of St. Sylvester sounded of itself.		D'Acheri, t. xi. p. 346; Duchêne, Histoire des Gaules, t. v. p. 362. Gentleman's Mag. vol. lvii. p. 175; Gazette de France of 14th April 1786.
1257	Poland					M. Cromer de reb. Polon. p. 159; Annales Silesie, p. 82, &c. Kämpfer v. Dohm, p. 222.
1258	Ditto					Chron. Cavense, Muratori, t. vii. p. 928.
1259. Oct. 4	Japan					Ditto.
— In Italy. Exact place not specified.						Raffles's History of Java, vol. i. p. 25; and vol. ii. p. 232.
1260	Trapani in Italy					v. Hoff; Voyage en Island, p. 313.
— and 1261	The little island of Flaty, in Breidaford, Iceland.					J. Malvecii Chron., Muratori, t. xiv. p. 938.
1264	Brescia				A comet visible at the same time	
1266	Bari, in Italy				The date 21st March 1266 is also given, Palm Sunday being the day mentioned by the chronicle.	Ephem. Neapol., Muratori, t. vii. p. 1103.

1.	2.	3.	4.	5.	6.
1268. Night, between the 1st and 2nd Nov.	Modena, and elsewhere in Italy.				Annales veteres Mutinensium, Muratori, t. xi. p. 70.
— Nov. 3	Padua	Two great shocks			Regina Padua, Muratori, t. viii. p. 379; Monachi Patavini Chron., Muratori, t. viii. p. 730.
— Or 4. Middle of the night.	Kingdom of Naples, at the lake Celano.			This earthquake, and the last two probably took place at the same time, although the dates are not exactly concordant.	Leander and Albertus Bononiensis.
—	In Cilicia			60,000 persons were killed.	Abulfaradach, p. 572.
1273. Beginning of Mar.	Durazzo	The movement was at first oscillatory, and afterwards appeared as if the surface of the earth were alternately contracted and dilated with great violence.		Preceded by subterranean noises for some time, which gradually increased in intensity up to the time of the earthquake.	Pachymeris Hist. l. lib. v. c. 7. pp. 242 and 537.
—	Azerbidshan and Tabriz in Persia. Also in Thrace.				Bar Hebraeus, p. 548; Cent. Magd.
1274. Dec. 5	Throughout England			Accompanied by thunder and lightning, a comet, and a <i>fiery dragon</i> .	Matthew of Westminster, p. 363; Polydore Virgil, p. 414.
—	Pays de Galles			Accompanied by a <i>rain of blood</i> .	Polydore Virgil, <i>loc. cit.</i> ; Fascic. temporum.
1275. Sept. 11. Between the 1st and 3rd hours of the day.	In England			Many of the most famous churches of England thrown down or injured; among others that of St. Michel-du-Mont near Glaston.	Matthew of Westminster, p. 364.
—	At S. Damiano in Piedmont.				Chron. Astense, Muratori, t. xi. p. 163.
1276. July. At sunset.	Genoa				Caffari, Annales Genuenses, Muratori, t. vi. p. 566.
—	Arcastia, in the province of Agrigento; also at Agrigento.	At Cilath the shocks lasted nine hours.		The walls and other buildings were thrown down, and many lives lost.	Bar Hebraeus, p. 553.
—					Mercurius Hist. p. 148.

1278. 24.	Italy. April Venice, and almost all the rest of Italy.	Very violent. Recur- red again on the 30th.	Other authorities place this event in 1279, giving the same days and month, while others again mention it on the 1st of May.	terremoti, c. 3. Andreae Danduli Chron., Muratori, t. xii. p. 397; Vite de' Duchi di Venezia, p. 571. Polydore Virgil, lib. xvi.
1280	In France and En- gland The island Sumbava near Java.		The little island Selo Parang was produced by this earthquake, being separated by it from the island of Sumbava.	Raffles's History of Java, vol. i. p. 25, and vol. ii. p. 232.
1282 Jan. 17. Hour of ves- pers.	At Venice		The date 1283 is also given	Vite de' Duchi di Venezia, p. 574.
—	Gap in Dauphiny			v. Zach, Correspondance Astro- nomique, t. vi. p. 32. Johann de Oppido; Cent. Magdeb.
1283. Easter.	In the neighbourhood of Naples. At Mtakitha in the Cau- casus.	The earthquake began on Thursday, re- curred on Friday and Saturday, and again occurred on Easter Sunday.	The cathedral of Mtakitha fell into ruins	Philadelphine sur les tremblemens de terre dans le Caucase.
1284 1285. Dec. 13	In England Ferra in Italy			Collection Académique. Chron. Estense, Muratori, t. xv. p. 339. Abulfaradech.
—	In the East. Particular locality not specified; said to be widely ex- tended.			
1286. before the 9th Oct.	Some in Brittany, especially at Vannes.	Lasted forty days. The shocks recurred at intervals for a year.		Moëze, Histoire de Bretagne, t. i. col. 31.
1287. 1289.	Rome "Per universam orbem terrarum." France Fistia in Italy	Several shocks. Violent shocks, which continued a long time.		Cent. Magdeb. Ditto. Mémorial de Chron. t. ii. p. 912. Ann. Ptolomæi Laccensis, Mura- tori, t. xi. p. 1298.



1.	2.	3.	4.	5.	6.
1290 .....	Nearly universal in Europe. Felt most violently in Iceland, Switzerland, and at Lisbon; especially at the last of these.	.....	.....	Probably all these earthquakes in various places did not occur at the same time of the year.	Bertrand; Collection Académique; Voyage en Island, &c.
1292 .....	Rome .....	.....	.....	.....	Baglivi, p. 542.
1293. July 10 and 11.	Borgo-S-Sepolcro .....	Many violent shocks. At Pistoia they recurred for 24 days.	.....	Accompanied by violent storms of wind .....	Sarti, c. 3. Chron. Parmense, Muratori, t. ix. p. 825.
1294 .....	In Spain .....	.....	.....	.....	Palasson, Nouveaux Mémoires sur les Pyrénées, Pau, 1823.
1295. Sept. 4.	In the bishopric of Tours. About noon. Also in the Rhetic Alps, and at Constance.	Probably lasted several days.	.....	An eruption of Hecla began at this time, and never altogether inactive.	Epitome Mundi; Cent. Mag.; Lycothènes; Diarium Hist.; Eborac.
1296. June 1. Middle of the night.	Constantinople .....	Several shocks .....	.....	In the Rhetic Alps fifteen castles were destroyed.	Nicephori Gregoræ Hist. Byzant. lib. vi. c. 9, p. 124; Pachymeria, 1. lib. v. c. 7, p. 158.
1298. Jan. 5. At twilight.	In England .....	.....	.....	.....	Matthew of Westminster, p. 412.
1299 .....	Spoleto, Reasi, and Pistoia in Italy.	Shocks lasting for several days.	.....	Others give the dates 1295, and 1300 .....	Giovanni Villani, lib. vii. c. 25, Muratori, t. xiii. p. 361; Martène et Durand; Labbe, &c.
1300. Dec. 28.	In Germany .....	.....	.....	.....	Edinburgh Encyclopedia, Article Chronology.
1301. June 11. At dawn, about noon, after vesper, and about midnight.	Throughout Italy .....	Many violent shocks. Four shocks, at the hours mentioned.	.....	This place was destroyed .....	v. Humboldt, Asie Centrale, t. ii. p. 110.
1301. June 11. At dawn, about noon, after vesper, and about midnight.	Place not mentioned. Somewhere in Italy.	.....	.....	Hecla had been in eruption for some time before.	Ant. Campo, Hist. di Cremona, p. 84. Fragmenta Hist. Perforjellensis, Muratori, t. xxiv. p. 1206.

1302	at Venice. At Riette (Rieti?) in Italy.						p. 582. Collection Académique.
1303.	Aug. 8. Alexandria and Acre, throughout the Peloponnesus, Candia, and all the Adriatic Sea. Felt but little at Venice.					The walls of Hama and Alexandria were partly thrown down. Some other chroniclers give the dates 1302 and 1304.	Hadschi Chalifa; Abulfeda, v. p. 191; Vite de' Duchi di Venezia, loc. cit. p. 772.
—	In Poland						Gentleman's Magazine, vol. lvii. p. 175; Gazette de France, 14 Avril, 1786.
1304.	Oct. 23 In Italy. Exact place not mentioned. Probably felt at Ferrara and Placenza.						Chron. Estense, Muratori, t. xv. p. 351; Chron. Placent., Muratori, t. xvi. p. 485.
1306?	Some time after the earthquake in Candia.					Many houses thrown down	Ricobaldi Ferrar Chron., Muratori, t. ix. p. 254.
1307.	In the Japan	Very violent					Kämpfer (v. Dohm), p. 229.
1311	Laybach in Carinthia						Vassali—Eandi sur les tremblemens de terre du 2 Avril 1808, p. 132.
1316.	Sept. At St. Denis in France						D'Acheri, Spicilegium, t. xi. p. 667.
1317.	Dec. In Italy	Two shocks in twenty-four hours.					Martène et Durand, t. v. p. 561.
1318.	Sept. At Cologne	Lasted a long time					Acta Trevir. Archiepisc.; Martène et Durand, t. v. p. 407.
—	Nov. 14. In England						Thom. Walsingham, Hist. Angl.; Camden, Angl. Norm., p. 111; Collection Académique.
1319	In the provinces of Ararat and Sini in Armenia.	Very violent					Dubois de Montpéroux, Voyages autour du Caucase, t. v. p. 287; Chakhathouno, t. ii. p. 19.
1320.	Oct. Sienna in Italy	Shocks during several days and nights.					Chron. Saenese, Muratori, t. xv. p. 62.
and	In England						Edinburgh Encyclopædia, article Chronology.
1321	May 25 In Germany	Venice was inundated.					Baglivi, p. 542.
1322.	June 1.	Exceedingly violent.					Lycosthenes; Diarium Hist. p. 158.
or							

1.	2.	3.	4.	5.	6.
1322. End of Nov.	At Geneva				Bertrand; Collection Académique.
1325. May 21. After 3 o'clock.	At Pisa	Several very violent shocks.			Chron. di Pisa, Muratori, t. xv. p. 998; and t. xvi. p. 648.
1326. In summer.	Florence	Very violent, but lasting a very short time.		Followed by a luminous meteor the night after.	G. Villani Chron. lib. ix. c. 297, Muratori, t. xli. p. 571.
1328. Aug. 4. 1st hour of the day.	Bohemia, Thuringia, Mysnia (Meissen?), and other parts of Germany.				Chron. Aulæ Regiæ, Rerum Bohemicæ, Fréher, p. 55.
— Sept.	At Brünn.			During a period of very rainy weather, which had been preceded by extreme heat and drought.	Ditto, p. 62.
— Dec. 1. 1 a.m.	Italy, especially at Perugia and the neighbourhood.			In the following month (October) violent storms were experienced in France.	D'Acheri, loc. cit. p. 733.
1329. May 22. In the evening.	Rome, Norcia, &c., in the states of the church. Most violent at Norcia.	The shocks continued at intervals for some months afterwards.		Norcia was completely ruined: 5000 persons perished.	G. Taragnola, fol. 192; G. Villani; Collection Académique, &c.
1331. March 13.	At Prague. Also felt in the remainder of Bohemia and in Bavaria.				Chron. Aul. Reg., Rerum Bohemicæ, Fréher, p. 66.
	Cesena in Italy	Eighteen shocks during the day and following night. They did not entirely cease for a month.	The sea was agitated.		Annales Casenates, Muratori, t. xiv. p. 1152.
1332. Feb. 12. In the evening.	Thuringia and at Meissen. Also at Constantinople.			Accompanied at Constantinople by violent atmospheric perturbations.	Eberus; Niceph. Gregoras, Hist. Byzantine, p. 283 and 772.
1334. Feb. 23. In the morning.	Cesena in Italy				Annales Casenates, Muratori, t. xiv. p. 1157.
— Dec. 4.	Verona				Chron. Veronense, Muratori, t. viii. p. 649.
1335. May 15.	Mugello in Italy			In consequence of this earthquake, Monte Falterona near Decemanno separated, and an immense landslip took place, the body of earth moving more than four miles. The Arno and its affluents were troubled as far as	G. Villani, Muratori, t. xiii. p. 769.

1336. Sept. 5. Bologna?	.....	.....	.....	.....	Chron. di Bologna, Muratori, t. xviii. p. 369.
1337. Jan. 15. Cesena in Italy?	.....	Violent shocks.	.....	.....	Annales Casanatenses, Muratori, t. xiv. p. 1175.
and middle of the following night.	.....	.....	.....	.....	.....
1338. In Japan	.....	Very violent	.....	.....	Kämpfer v. Dohm, p. 230.
1339. In Iceland	.....	.....	.....	.....	Gaimard, Voyage en Islande, p. 313.
June 21. Cremona	.....	Very violent	.....	.....	Ant. Campo, Hist. di Cremona, p. 117.
Arezzo in Italy	.....	.....	.....	.....	Annales Arretini, Muratori, t. xiv. p. 879.
..... Tripolis in Syria	.....	.....	.....	.....	Hadschi Chalfa.
..... Southern part of Iceland	.....	.....	.....	.....	Followed the next year by a violent eruption of all the volcanoes of the south of Iceland.
1342. Towards Province of Utrecht	.....	.....	.....	.....	Gull. Heda, Hist. Ultrajectina, p. 242.
the end of the year.	.....	.....	.....	.....	.....
1343. Jan. 25. Venice	.....	Very violent shocks, which continued more or less for 15 days.	.....	.....	Tarcagnola, fol. 191; Sansovino, Hist. di Vinegia, p. 569; Magnani, p. 121.
20th hour (Italian time).	.....	.....	.....	.....	Petrarch, Op. epist. lib. v. epist. 72 (editio princeps).
Nov. 25. Naples	.....	.....	.....	.....	Hadschi Chalfa; Niceph. Gregoras, Hist. Byzantine, p. 434.
1344. Middle Constantinople, Syria, and Egypt.	.....	Many and violent shocks.	.....	.....	Baronius, t. xiv. p. 961; Charenton, Histoire d'Espagne, t. iii. lib. xvi. p. 500.
..... At Lisbon, and along the sea coast.	.....	Many violent shocks.	.....	.....	Kellhan on Norwegian earthquakes in the 'Magazin for Naturvidenskaberne,' Christiania, 1835, vol. xii., 82nd and following pages.
..... Southern part of Iceland; and the province of Guuldalen in Norway.	.....	.....	.....	.....	.....
1345. Jan. 31. Reggio in Italy	.....	Very considerable	.....	.....	Chron. Regiense, Muratori, t. xviii. p. 60.
Feb. 1. Venice	.....	The shocks lasted fifteen days.	.....	.....	Lycosthenes; Fryschius.
Sept. 12. Florence, and other places in Tuscany.	.....	.....	.....	.....	G. Villani, loc. cit. p. 930.

1.	2.	3.	4.	5.	6.
1346. Dec. 22. At night.	Florence, and other places in Tuscany. Western part of Iceland.		A hitherto unseen rock was elevated in Breidaford.		G. Villani, <i>loc. cit.</i> p. 930. v. Hoff.
1346. Feb. 22. In the evening.	At Reggio?				Chron. Regiense, Muratori, t. xviii. p. 62.
Night between 24 and 25.	Nov. Switzerland, especially at Bâle.			Many buildings thrown down.	Bertrand; Collection Académique.
1348. Jan. 25.	Constantinople Hungary, the Tyrol, Italy as far south as Rome and Naples, Bavaria, Carinthia, Switzerland, parts of Germany, and Poland. Especially violent at Rome, Venice, and Bâle.	Very violent. The shocks recurred at intervals for forty days.		Caused very great destruction of buildings. The earth opened in different places, and pesti- lential exhalations came forth. <i>A rain of blood</i> is mentioned as having fallen in several localities. Great damage was done to build- ings, &c. The date of the year seems very doubtful, as different authors vary from 1343 up to 1349, and indeed, it does not seem cer- tain that there was not more than one earth- quake of great extent about this time.	Poggendorff's Annalen, t. lviii. p. 652. Martine et Durand, t. v. p. 254; Baronius, t. xiv. p. 1048; Conrad v. Lichtenau, p. 193; Chron. Hir- saug.; Lycosthenes; Fryschius, &c.
— Feb. 6. Frankfort on the Maine — Feb. 7. Modena?					Lerner's Chronik; Kriegk. p. 14. Annales veteres Mutinensium, Mu- ratori, t. xi. p. 82.
1349. Sept. 9. At night. At the hour of mass.	Bologna, Orvieto, and as far as Pisa.			The rivers, &c. were troubled for more than twelve days.	Chron. d'Orvieto, Muratori, t. xv. p. 654; Chron. di Bologna, Mu- ratori, t. xviii. p. 414; Chron. Casinense, &c.
— 10.	Rome, Naples, and all the south of Italy. Also felt throughout most of the other parts of Europe. Rome. Also felt at Nardo.	The shocks which commenced now lasted more than eight days.		Great damage done to buildings	Baglivi, p. 542; G. Villani, Mur- atori, t. xiv. p. 46.
1350					Baglivi; Collection Académique; Chron. Neritimum, Muratori, t. xxiv. p. 908.
—	At Lisbon				Fr. Kries, von den Ursachen der Erdbeben, S. 16.
—	In Switzerland				Schmiedler's Geognosie, p. 141.
1352. Dec. 25. In the evening.	Borgo-S. Sepolcro in Italy.	Continued until the 31st.		A mountain was cleft by this earthquake.	Mathæo Villani, Muratori, t. xiv. p. 189.

1353. Jan. 1. Borgo-S-Sepolero and Modena.	The shocks were very violent, and continued at intervals for more than a month.	2000 people lost their lives	Matheo Villani, and Chron. Mutinense, Muratori, t. xv. p. 618.
— March 1. In Romagna, extending all along the coast, and even to Constantinople.	Very violent shocks.		Matheo Villani, Muratori, t. xiv. p. 227.
1354. In the beginning of spring.		Great damage done to both life and buildings. Probably only the same event with the last.	Cantacuzene, Hist. 2. p. 861.
1355. Sept. About the 9th hour.	Bâle and Strasburg	Buildings thrown down. The two-vol. edition of the chronicle cited does not mention this event.	Chron. Hirsang. (one-vol. edition), p. 295.
— Rome			Collection Académique; Baglivi, p. 542.
1356. Aug. 24. Lisbon	The shocks lasted a quarter of an hour, and continued at intervals for a year.	Many buildings thrown down	Tavares, über die mineralwasser Portugals; Mém. de Chronol. t. ii. p. 912.
— End of Spain, especially at Cordova, Seville, and Basala.			Matheo Villani, Muratori, t. xiv. p. 404.
— Sept. and beginning of Oct. Also slightly in Tuscany.			
— Oct. 18. All the upper Rhine, especially at Strasburg and Bâle, district of Constance, Lausanne, Berne, and the borders of Bavaria. Guillaume de Nangis says that Rheims and Paris also experienced it.	The shocks recurred at Bâle during the whole of the year.	Thirty-eight chateaux were destroyed in the bishopric of Constance. At Bâle, after the shocks, the town took fire, and the flames were not extinguished for some days.	Bertrand; Lycosthenes; Frytschius; Chron. Hirsang; Guillaume de Nangis, &c.
1357. May 14. About 7 or 8 A.M.	Bâle, Strasburg, and all through Alsace, Neuchâtel and Soleure in Switzerland. Also in Swabia, and in Spain at Seville and Cordova.		Chron. Hirsang; Martineet Durand; Lycosthenes; Frytschius; Bertrand, &c.
1358. Laybach in Carniola		Followed by an abundant harvest	Collection Académique.
— Poland			Gentleman's Magazine, vol. lvi. p. 175; Gazette de France, 14 Avril, 1786.

1.	2.	3.	4.	5.	6.
1361. July 17. District of La Puglia in Italy. Hour of vespers. Dec. 27. At Sienna In the morning.		Violent shocks		At Ascoli 4000 persons perished	Mathæo Villani, Muratori, t. xiv. p. 564.
		Seven terrible shocks, and in the next twenty-four hours seventeen or eighteen, great and slight. The shocks did not entirely cease for four days.		Great destruction of buildings. The inhabitants encamped under tents. Followed by disease.	Chron. Sanese, Muratori, t. xv. p. 169.
1363. (On a Thursday.) Midnight.	On a Modena?	Three shocks		Accompanied by noise	Annales veteres Mutinensium, Muratori, t. xi. p. 83.
1364. Feb. 1	Bologna?	Two violent shocks			Chron. di Bologna, Muratori, t. xviii. p. 473.
1365. Mar. 4. At night.	Venice, Padua, Treviso, Ferrara, and the country round.	Great shocks for an hour.		The Chron. Estense says the 6th March, and only mentions Ferrara as affected.	Ditto, p. 477.
— July 25	Bologna	Violent shocks		Accompanied by thunder, and followed, the next day, by a violent storm.	Ditto, p. 478.
1367. Sept. 21. At the rising of the sun.	Verona.	A violent shock, followed after an interval of half an hour by a second.			Chron. Verona., Muratori, t. viii. p. 658.
1368. In Whit-sun-week. (Whit-Sunday being on the 21st May.)	In Thuringia, at Mühlhausen, Eisenach, and other places.				Rivander's Thüringische Chronica, p. 426.
1370	Province of Alves in Iceland.				Voyage en Islande, p. 313; v. Hoff.
1372. June 1. At Bale		Some slight tremulous motion, not felt except in the immediate environs.		The Collection Académique mentions a second earthquake at the same place on the 1st July of the same year, but it is probably only a mistaken date for the single event here mentioned. Five days after the earthquake a ring round the sun and two crosses were	Collection Académique; Lycosthenes.

1373.	Jan.	in Arragon, Spain. Vicenza in Italy	Two very violent earthquakes on the same day.	Accompanied by noise	Annales Vicentini, Muratori, t. xiii. p. 1240.
—	Mar. 1.	Venice	A great earthquake.		Marino Sanuto, <i>Vite de' Duchi di Venezia</i> , Muratori, t. xxi. p. 673.
—	2nd hour of the day.				Chron. Viaticense, <i>Marca Hispanica</i> , p. 759.
—	Middle of the night.	Arragon in Spain	One shock		Ditto.
—	After the setting of the sun.	19. Ditto	A second shock		
—	April.	Vicenza in Italy		Accompanied by noise	Annales Vicentini, Muratori, t. xiii. p. 1240.
—	At night.	Venice	Another great earthquake.		Marino Sanuto, <i>loc. cit.</i>
—	May 19				Ditto.
—	June 5	Ditto			Petit <i>Thalamus de Montpellier</i> , MS. communication from M. de Christol to M. Perrey.
1374	—	Montpellier in France.	Four earthquakes during the year.		Annales Vicentini, Muratori, t. xiii. p. 1244.
1376.	March 12.	Vicenza in Italy	Preceded by three others betw <sup>n</sup> the 25th Dec. and this date.	Accompanied by noise. Every one considered this earthquake as not less violent than that of the 25th January 1348.	
—	19. Ditto		Very violent.	The morning bright and clear. Much hail and snow during the day and evening. The earthquake accompanied by noise.	Ditto.
—	At night.			Attended with noise	Ditto.
—	April.	Ditto	Four more shocks		
—	Night between 10 and 11.				
1378.	—	In the north of Spain.		Masses of rock were detached from the Pyrenees and fell into the valleys below.	Palassou quotes <i>Abrégé nouveau de l'Histoire d'Espagne</i> , t. xi. p. 122. (Edit. in 12mo.)
—	June 1	In Switzerland	A considerable earthquake.	Bertrand and the <i>Collection Académique</i> give the date 1st July 1380, but it is probably the same with that mentioned here.	Lycosthenes; Bertrand; <i>Collection Académique</i> .
—	April 20	Various parts of France and Switzerland. Also in Italy.			Bertrand, p. 38; Massena.



1.	2.	3.	4.	5.	6.
1382. May 21 and 24.	In Britain. Also in France, Brabant, Flanders, and the country round.	.....	Some days after, vessels were violently dashed against one another by the agitation of the waves.	Most violent in England. The Collection Académique says that there were reiterated shocks this year in Switzerland and Italy, and great disease in the former country, as also in Germany, there being a complete absence of winds there. Lycosthenes gives the date 1381. The buildings were rocked from side to side like trees in a tempest. After midnight all were in ruins. 500 persons perished.	Martine et Durand, t. v. p. 321; Baronius, t. xv. p. 88; Collection Académique, &c.  Muratori, t. xviii. p. 90.
1383. Aug. of Hour of nones.	At Mytilene.....	Extremely violent shocks.	.....	.....	Muratori, t. xviii. p. 90.
1388. July 16 At night.	In England.....	Followed by another earthquake the same year, the exact date of which is not given.	.....	.....	Thom. Walsingham, Hist. Angl., Camden, Anglic. Norm. p. 315 and 326; Collection Académique.
— Sept. 19. Middle of the day.	Vicenza.....	.....	.....	Accompanied by noise.....	Annales Vicentini, loc. cit. p. 1262.
1389. Feb. 10. Immediately before sunrise.	Ferrara?.....	Lasted twenty minutes.	.....	.....	Chron. Estense, Muratori, t. xv. p. 503.
— Oct. ....	In Tuscany, especially at Castello, Mercatello, and Borgo-S-Sepolcro. <i>Feesly</i> felt throughout almost all Italy.	.....	.....	Many buildings thrown down.....	Annales Forolivienses, Muratori, t. xvii. p. 196.
1391. March 22.	In Switzerland.....	.....	.....	A comet appeared to the people of Germany, followed by great rains, inundations, famine, and pestilence.	Lycosthenes; Collection Académique.
— .....	Throughout almost the whole of Iceland.	.....	.....	.....	Voyage en Islande, p. 313; v. Hoff.
1392. Jan. 27.	All the Neapolitan coast.	No land shock mentioned.	The sea retired more than 40 paces, leaving the shore dry.	.....	Annales Bonincontrii, Muratori, t. xxi. p. 60.
1393. May 30 to June 16.	Galiata in Italy.....	Numerous shocks.....	.....	Caused great damage.....	Chron. di Piero Minerbetti, Muratori, t. xxvii. p. 317.
— July 5	Bologna.....	Violent shocks.....	.....	"On the 11th little children had the small-pox, and on the 18th there was a terrible tempest."	Chron. di Bologna, Muratori, t. xviii. p. 356.
1394. Mar. 22	Switzerland, France, and Germany.	Exceedingly violent.....	.....	The mountains were shaken to their summits. Followed by excessive heat, and an abundant and early harvest.	Bertrand; Scheuchzer; Mém. de Chronol. t. ii. p. 913.

1398. Dec. 18. 9 A.M. to 4 P.M.	Province of Valencia and at Tortosa in Spain.	Many shocks	Many buildings, &c. ruined. At Alcira two fountains gave forth water of an abominable smell, and the colour of ashes.	Baronius, t. xv. p. 167.
— of December.	Middle Valentino in Italy	.....	.....	Chron. Neritium, Muratori, t. xiv. p. 908.
—	Nardo, and all through the province of Otranto.	.....	.....	.....
—	At Antwerp	.....	So violent that dishes, &c. would not remain at rest on the tables.	Communication of M. Quetelet to M. Perrey.
—	In Germany	.....	Accompanied by an epidemic	Physicallische Betrachtungen über das Erdbeben, u. s. w. Vorrede. Petit Thalamus de Montpellier, MS. Communication of M. de Christol to M. Perrey.
1397	Montpellier in France	.....	.....	Annales veteres Mutinensium, Muratori, t. xi. p. 83.
1399. July 20. 5th and 6th hours.	Modena?	Two violent shocks	.....	.....
— — — 21. 6th hour of the night.	Ferrara	.....	A pestilence in the country, the same year	Annales Estenses, Muratori, t. xviii. p. 958.
1402	Syria	.....	Many towns were ruined, and mountains overthrown.	Muratori, t. xviii. p. 974.
1403. Mar. 17	Rome	A violent earthquake.	.....	.....
—	Japan	.....	.....	Baglivi, p. 542; Collection Académique.
1405	Ditto	.....	Accompanied by an eruption of a volcano in the province of Simotaky in Japan.	Kämpfer v. Dohm, t. i. p. 232. Ditto.
1406. Sept. 16. 3rd night.	Naples	.....	.....	Giornali Napolitani, Muratori, t. xii. p. 1070.
1408. Jan. 3. At	Ferrara?	Slight, and lasting but a short time.	.....	Annales Estenses, Muratori, t. xviii. p. 1045.
1409. Aug. 16. At	Japan	.....	.....	Kämpfer v. Dohm, t. i. p. 232.
1409. Aug. 16. At	Ferrara. Not felt elsewhere.	.....	.....	Diario Ferrar., Muratori, t. xiv. p. 174.

1.	2.	3.	4.	5.	6.
1410. Aug. Night between 9 & 10.	Venice .....	A slight shock. ....	.....	Followed, on the evening of the 10th, by a terrible tempest, which did great damage.	Vite de' Duchi di Venezia, <i>loc. cit.</i> p. 853.
1413. Aug. 8	Sienna .....	The shocks continued night and day (for how long?).	.....	Many houses, &c. were thrown down	Archivio dello Spedale.
1414. Aug. 3.	Pisa, Lucca, Florence, and Borgo-S. Sepolcro.	Very violent shocks.	.....	At Borgo-S. Sepolcro houses were thrown down, and 200 persons perished.	Archivio storico Italiano, t. vi.
Hours of none and vespers.	7. Florence .....	Two very violent shocks.	.....	Overthrew 200 chimneys, and cracked some of the walls.	Istorie di Firenze, Muratori, t. xix. p. 956.
1415. June 21	Bâle .....	.....	.....	The inhabitants took flight	Bertrand and Coll. Académique.
1416. July 22	Ditto .....	.....	.....	Possibly only the same with the last	Bertrand; Collection Académique; Lycosthenes; Scheuchzer.
1418. A little before Apr. 7.	Throughout Dalmatia .....	Shocks on several days, and nights. Very violent.	.....	Many houses ruined, and the walls of a castle overthrown.	Muratori, t. xxii. p. 920.
1419. (Sept.?)	Above Trente, towards Morano in Italy.	.....	.....	The earthquake caused an inundation between two mountains. 600 cabins were ruined, and 800 persons perished. (By the earthquake or the inundation?)	Vite de' Duchi di Venezia, <i>loc. cit.</i> p. 930.
1420 .....	Sienna .....	Very great. It lasted the time one would take to make twenty steps.	.....	.....	Annali Sanesi, Muratori, t. xix. p. 428.
— .....	Province of Catalonia in Spain.	The earth trembled every day (for how long?).	.....	The town of Amer was overthrown	Palasson, Suite des Mém. pour servir à l'Histoire nat. des Pyrénées, p. 379.
1421. Sept. 18	Negropont .....	Violent shocks lasting for four days.	.....	The people lived in tents during this earthquake.	Muratori, t. xxii. p. 940.
1425. Aug. 10. 1 p.m.	Ferrara .....	One great shock at the time mentioned, and two others an hour and a half after.	.....	Chimneys were thrown down by the last two shocks.	Diario Ferrar., Muratori, t. xxiv. p. 185.
.....	About the whole	The shocks lasted for two hours.	.....	Preceded by a dreadful tempest	Stow's Annals, p. 368; Collection Académique; Mém. de Chronol. &c.
.....	.....	.....	.....	.....	Edinburgh Encyclopædia, Article Chronology.

(May) In Spain, especially at Olot in Catalonia. Also felt at Montpel- lier in France.	Numerous shocks	Twenty towns were much injured. In this year one of the well-known ridings of the island of Santorin in the Archipelago took place.	Huot, Cours de Géologie, t. i. p. 109; Palassou, p. 378.
Feb. 2 Ditto		Many towns ruined	The Catalan manuscript cited above, as quoted by M. Fournet in the memoir of M. Perrey on the earth- quakes of the basin of the Rhone, Notes additionnelles. Annales Forolivienses, Muratori, t. xxii. p. 215.
July 4 In Romagna		Chimneys thrown down in many places	Annales Forolivienses, Muratori, t. xxii. p. 215.
Dec. 13. Bale, and the country round.		Tiles were thrown from the roofs, chimneys over- thrown, and walls cracked. Great damage was done throughout the canton.	Lycosthenes; Bertrand; Collection Académique; Scheuchzer.
1429. Sept. 16. Forli in Italy	Lasted but a short time.		Chron. Foroliv., Muratori, t. xix. p. 902.
1430. Aug. 12. Sienna	A great and sudden earthquake.		Tizio, Hist. Senens. t. i. p. 212.
1431. April. Catalonia, Arragon, and at Roussillon. Also at Ciudad Real.	Exceedingly violent.	Some fortifications were thrown down	Charenton, Histoire d'Espagne, t. iv. liv. 21. p. 263; Palassou, p. 261.
Some time after the 24th.			Ditto.
May.	Laybach in Carniola	Followed by great fertility	Collection Académique.
1433.	Bologna		Signoria, de episec. Bononien. lib. iv. p. 470.
	Throughout Silesia		Annales Silesiae, Cur. Freustadiensi, p. 312.
March. Sienna	Very violent	The bells were made to sound, and houses were overthrown.	J. Bandini, Hist. Senen., Muratori, t. xx. p. 48.
1436. Towards the end of the month June 10. Piacenza, Parma, and the neighbourhood.		Houses thrown down	Annales Placentini, Muratori, t. xv. p. 875.
1436. hour of the night.		Many buildings ruined	Annales Silesiae, p. 137; Martini Cromeri, de Reb. Polon. p. 328; Bonfinius, Rerum Hungar. dec. 3. lib. vi. pp. 456, 465, &c.
the June 5 Bohemia, Silesia, Po- land, and especially Hungary.			

1.	2.	3.	4.	5.	6.
1444. Nov. 30. Before sunrise.	Bâle and its environs	A slight earthquake		In the beginning of this year there were eruptions of Etna, and volcano in the Lipari islands, each accompanied by earthquake shocks.	Bertrand; Scheuchzer; Collection Académique.
1448. Nov. 4	Rome			All the houses were much shaken.	[part 2. p. 1132. Vitæ Rom. Pontif., Muratori, t. iii.]
1448 or 1449	Naples			Some thousand people perished.	Lycosthenes; Frytadius.
1449. Apr. 23	Ravenna			Preceded by continuous rain	Collection Académique; Bertholon, Electr. des Météores, t. i. p. 370.
1449. Apr. 23	"In Flanders and some other places."				Platina and Masæus.
1450	Laybach in Carinthia	Extremely violent		Followed by a frightful pestilence.	Collection Académique.
1450	In the kingdom of Naples.			Naples, Ariano, Cara, and other towns suffered greatly.	Frytadius; Casp. Goldwurm, Beschreibung göttlicher und teuflischer Wunderzeichen, Frankfurt, 1567; Sebast. Francens, Chronicon Germanie.
1453. Sept. 28. 4th-5th hour of the night.	Florence	According to Martène & Durand the shocks lasted seven hours. The Chron. di Bologna says that they recurred on the 30th Sept. and 1st Oct.		Many walls cracked, and chimneys thrown down.	Chron. di Bologna, Muratori, t. xviii. p. 703; Martène et Durand, t. v. p. 482.
1454. Dec. 4	In La Puglia, the Calabria, and Naples.	Shocks during three days.			Mémorial de Chronologie, t. ii. p. 913.
1455. Dec. 20. 4th, 5th, and 9th hours of the night.	Bologna	Three shocks at the hours mentioned.		The first shock threw down some chimneys, &c. and was accompanied by noise. Sigonius gives the date Dec. 21.	Chron. di Bologna, loc. cit. p. 719; Annal. Bonon., Muratori, t. xviii. p. 888.
1456. Aug. 22	Sienna				Sarti, Saggio di congettura su i terremoti, loc. cit.
2 A. M. — 26. Liège					Martène et Durand, t. v. p. 491.
Dec. 5. Between the 10th and 11th hours of the night. (v. Hoffm.)	Throughout the kingdom of Naples. Also felt at Rome, and probably further north. Lautanne and all the Canton du Vaud were violent.	Very violent and destructive shocks.		A great many towns very much injured. 60,000 persons perished. Sarti reports it as having been felt at Sienna on the 9th, but it is probably only the same earthquake.	Baronius, t. xvii. p. 176; Giannone, Hist. di Napoli, t. iii. p. 7; Martène et Durand, t. v. p. 494; Collection Académique, &c.

1456. Dec. 25. Ditto About 6 A.M.							Ditto.
1457. Apr. 26. Ditto 22nd hour.							Ditto.
From evening to morning.							Ditto.
— 30. Ditto, principally at Perugia.							Ditto.
— 54 hour.							Ditto.
— Island of Hydra in the Archipelago.							Ditto.
1458. April 7. Castello							Ditto.
1459. Mar. 18. Sienna							Ditto.
1st hour of the night.							Ditto.
— Nov. Ditto							Ditto.
7th hour of the night.							Ditto.
1461. June. Bocino							Ditto.
— Aug. Ditto							Ditto.
— 22. Sienna							Ditto.
2nd hour of the night.							Ditto.
the Sept. 3. Ditto							Ditto.
— Nov. 20. Aquila							Ditto.
— 27. Ditto							Ditto.
hour of the night.							Ditto.
1463. Jan. 22. Rome							Ditto.
1465. Jan. 22. Bologna?							Ditto.
1466. hour of the night.							Ditto.
1467. hour of the night.							Ditto.
1468. hour of the night.							Ditto.
1469. hour of the night.							Ditto.
1470. hour of the night.							Ditto.
1471. hour of the night.							Ditto.
1472. hour of the night.							Ditto.
1473. hour of the night.							Ditto.
1474. hour of the night.							Ditto.
1475. hour of the night.							Ditto.
1476. hour of the night.							Ditto.
1477. hour of the night.							Ditto.
1478. hour of the night.							Ditto.
1479. hour of the night.							Ditto.
1480. hour of the night.							Ditto.
1481. hour of the night.							Ditto.
1482. hour of the night.							Ditto.
1483. hour of the night.							Ditto.
1484. hour of the night.							Ditto.
1485. hour of the night.							Ditto.
1486. hour of the night.							Ditto.
1487. hour of the night.							Ditto.
1488. hour of the night.							Ditto.
1489. hour of the night.							Ditto.
1490. hour of the night.							Ditto.
1491. hour of the night.							Ditto.
1492. hour of the night.							Ditto.
1493. hour of the night.							Ditto.
1494. hour of the night.							Ditto.
1495. hour of the night.							Ditto.
1496. hour of the night.							Ditto.
1497. hour of the night.							Ditto.
1498. hour of the night.							Ditto.
1499. hour of the night.							Ditto.
1500. hour of the night.							Ditto.

1.	2.	3.	4.	5.	6.
1465. 13 <sup>th</sup> .) (May Gubbio?)		Two great earthquakes, followed by a third still greater during the night.			Chron. Eugubinum, Muratori, t. xxi. p. 1009.
1466. Jan. 14. 9th hour.	Naples and the country round, especially at Bosconio, Pietropagano, &c.	Lasted the time of a <i>miserere</i> , decreasing however in violence towards the end.			Istoria Napolitana, Muratori, t. xxiii. p. 234.
— In summer.	Soissons and the neighbourhood.	Great earthquakes		Many buildings thrown down. Accompanied by a pestilence and great storms.	Mézerei, t. ii. p. 126 (3 vol. edit.).
— Oct.	Gubbio.				Chron. Eugub., Muratori, t. xxi. p. 1013.
Night between 27 and 28.	Ditto				Ditto.
— Dec. 26. 15th hour.	Japan	Many earthquakes in the same year.			Kämpfer, v. Dohm, p. 233.
1467. Aug. Sienna		Very violent shocks, lasting for twenty days.			Hist. Senen., Muratori, t. xl. p. 63.
End of the month.	Vienna	A disastrous earthquake.			Chronicon Haselbergii Viennense.
1468. Feb. ....		One shock		Accompanied by great cold and a heavy fall of snow. Mérian gives the date 21st Feb.	Chron. Eugub., Muratori, t. xxi. p. 1020.
1470. Feb. 6. Bâle		Great and numerous shocks.		The author who reports this event, says that there fell this year in Italy hailstones larger than ostrich eggs.	Philippi Bergomat. suppl. chron. fol. 388.
5 P.M. March	Gubbio?			Rain continuous for almost the whole month	Annales Placentini, Muratori, t. xx. p. 942.
1471. March	Brescia				Allegretti, <i>loc. cit.</i> p. 781.
— Aug. 15. 22nd hour.					Ditto.
1473. May 7. 13th hour.	Milan, Pavia, and Piacenza.	Five great shocks			Lerner's Chronik; Krieger, <i>loc. cit.</i>
1474. Dec. 17. 17th hour.	Sienna	One shock			
— 18. 12 in the morning.	Ditto				
1475. Aug. 24. Frankfurt on the Main.					

1481. Feb. 7. Parma 5th hour of the night.	Three shocks	.....	.....	.....	Diarium Parmense, Muratori, t. xxii. p. 364.
— Pisa and Lucca	Very great shocks	.....	.....	.....	Matthiæ Palmerii, <i>loc. cit.</i> p. 269.
— About Territory of Fivizzano in the middle of May.	Sixteen shocks	.....	.....	.....	Diarium Parmense, <i>loc. cit.</i> p. 373.
— After Island of Rhodes	.....	.....	.....	.....	Collection Académique.
Aug. 19. Ragusa.	.....	.....	.....	.....	Paul Parsch, Bericht über das Detonations-Phänomen auf der Insel Meleda bei Ragusa, Wien, 1826, 8. p. 188.
1482. Ditto	.....	.....	.....	.....	Ditto.
1483. Mar. 11. Ferrara.	A very great earthquake. The bell of Rìgebello sounded five strokes.	.....	.....	.....	Diario Ferrar., Muratori, t. xxiv. p. 266.
1484. Jan. 20. Rome. Also felt at Lamentana, Castel-Nuovo, &c. in the neighbourhood.	Lasted an <i>Ave Maria</i> .	.....	.....	.....	Vite Roman. Pontif., Muratori, t. iii. part ii. p. 1083.
1486. Sept. 30. Sienna	Two shocks, followed a little after by a third much more violent.	.....	.....	.....	Allegretti, <i>loc. cit.</i> p. 821.
— Naples	.....	.....	.....	.....	Vivenzio, Istoria de' tremuoti, &c. p. 11.
Dec. Padua	Very violent	.....	.....	.....	Tarcagnola, <i>loc. cit.</i> fol. 315.
1487. S. Sepolcro	One shock	.....	.....	.....	Sarti, Saggio di congettura, &c. Edinburgh Encyclopædia, Article Chronology.
1489. Constantinople	.....	.....	.....	.....	Huot, Géol., t. i. p. 110.
1490. In Italy, extending even to Constantinople.	.....	.....	.....	.....	Olivier, Voyage dans l'Empire Ottoman, t. ii. p. 298.
— The whole of the island of Candia.	.....	.....	.....	.....	Tarcagnola, Hist. del Mondo, t. iv. fol. 318.
End of In the Archipelago, especially in the island of Cos.	Very violent shocks	.....	.....	.....	Bertrand; Collection Académique.
1491. Oct. 7. Bale	Very violent	.....	.....	.....	
1492.					



	2.	3.	4.	5.	6.
Jan. 18. Sienna .....				Followed by a high wind, which increased during the night.	Allegretti, <i>loc. cit.</i> p. 828.
Feb. 1. Pisa .....		During the course of the month, many shocks both by day and night, of which some were very violent.			Portovenieri, <i>Memoriale, nell' archivio storico Italiano</i> , t. vii. part 2. p. 293.
Feb. 13. Ferrara .....		Lasted the time of saying a <i>pater</i> and an <i>ave Maria</i> .		Threw down thirty chimneys. It had been raining or snowing since the 1st, and the Po was much swollen.	Diasio Ferrar. <i>loc. cit.</i> p. 316.
— 30. Bologna .....					•
— "In the East" .....					G. Agricola, <i>Mineralog. Schriften</i> Teutisch. übersetzt von Lehmann, Freiberg, 1807, B. II. p. 209.
June 4. Sienna .....		Two very great shocks.			<i>Mémorial de Chronologie</i> , t. ii. p. 913.
ov. 10. Bale .....					Kämpfer, v. Dohn, p. 234.
May .....					Allegretti, <i>loc. cit.</i> p. 857.
June 5. Different parts of Switzerland .....					Marian, über die in Basel wahrgenommenen Erdbeben.
June 14th .....		Considerable shocks		Some chimneys were thrown down, and almost all the houses injured	Bertrand; <i>Collection Académique. Annal. vet. Musæum, Muratori</i> , t. xl. p. 86; <i>Diario Ferrar.</i> , Muratori, t. xxiv. p. 396.
— 9. Ditto .....		Another shock.		Threw down the church of St. Blaise.	Ditto.
Island of Candia .....					G. Dogliani, <i>Theat. Univ.</i> t. ii. p. 462.
Venice .....		Shocks, lasting for several hours.			<i>Mémorial de Chronologie</i> , t. ii. p. 913.
April 5. In Andalusia, especially, exceeding violent...		Exceedingly violent...		Buildings were thrown down	Ferreras, <i>Histoire d'Espagne</i> , t. viii. p. 262; Turquet, <i>Histoire d'Espagne</i> , p. 1334.
— 9. At Carmona, Seville, and Torina on the Guadalquivir.					
May 27. Geneva .....		A violent earthquake			Bertrand; <i>Collection Académique.</i>
June 10. Ditto .....		Violent shocks.			Ditto.
Aug. 23. In Belgium .....		Lasted but a short time.			Johannes de Los Chron. p. 119; Bulletin de l'Acad. de Bruxelles, t. ix. part 1. p. 559.

1605. June 30. About the middle of the year.	In Belgium	Lasted but a single instant. Extremely violent. On one day thirty-three shocks were counted, and each day abd night for four weeks there were two or three.	The earth opened in many places, and closed again, often throwing forth water, which took the place of the dry land. For a space of six to seven German miles the surface of the earth was so altered and disturbed that parts were sometimes raised as high as an elephant above their former level, and then sunk as deeply below it.	Johannes de Los Chron. p. 120.
Dec. 30. 9th hour of the night.	Bologna	More violent than the last.	Accompanied by subterranean bellowing noises	Berghaus' Annalen der Erdkunde, 3te Reihe. Bd. 1. p. 312, quoting Sultan Baber's Memoiren.
1506. Jan. 1. 11th hour of the night.	Ditto			Signonius, p. 521.
1507	Constantinople			Ditto.
	Island of Santorin			Huot, Géol. t. i. p. 110.
	Laybach in Carinthia			Dapper, Beschryving der Eilanden in de Archipel. p. 183.
1508. May 29.	In the Archipelago: especially in Candia, Paros, Naxos, and Chios.	Many shocks	A part of the island sank into the sea	Vassali—Eandi, loc. cit.
	Constantinople	Shocks for forty days.		Tarcagnola, t. iv. fol. 365; Muratori, t. xxiv. p. 595; Martin Baumgarten, lib. iii. c. 26.
			Probably at the same time with the last mentioned.	Mém. de Chronol. loc. cit.
	In Italy and Germany	Several earthquakes	Accompanied by atmospheric perturbations.	J. Nauclei Chron. t. ii. p. 547; Stumpfius.
1509 Sept. 14.	Constantinople, and all the rest of the Turkish dominions, both in Europe and Asia Minor.	The shocks were the most violent ever known here, and lasted according to some, 18 days, and to others 25.	1700 houses and large portions of the walls were thrown down, and some thousand people lost their lives. Tschorum, Gallipoli, Demitoka, and other towns were ruined. v. Hoff gives the date 1510.	Hadschi Chalifa; v. Hammer, Geschichte des Osmanischen Reiches, vol. ii. p. 349; Lycosthenes; Naucleus, &c.
Nov. 1. The 1st and 2. at night; the 3d at night; the 4th evening.	Freiburg in the Brisgau	Two shocks	The second was rather a noise and disengagement of gas than an earthquake. The first lifted the roofs into the air, and let them fall again, alternately.	Frytschius, Meteor. method. dialectica, fol. 142, verso.
16. Adrianople				Hadschi Chalifa; v. Hammer, loc. cit.

1.	2.	3.	4.	5.	6.
1509. Dec. 13.	Manosque (Basses-Alpes).				Statistique des Bouches du Rhône, Communication from M. Aug. Bravais to M. Perrey.
1510. June 10.	Nordlingen in Bavaria.			2000 individuals perished	Huot, Cours de Géologie, t. i. p. 110.
—	During in Italy; especially at Florence, Ravenna, and Venice.	Several earthquakes.		Accompanied by very high winds, and intense cold.	Mézerai, t. ii. p. 335 (4to edit.); Lycosthenes; Collection Académique.
1511. Mar. 26.	Venice. Also felt at Padua, Treviso, &c.	Rather considerable, but lasting a very short time.	The water in the canals was much agitated.	Some houses and statues were thrown down	Taracnoga, loc. cit. fol. 373.
—	Laybach in Carinthia			Followed by a dreadful pestilence	Collection Académique.
—	Japan			Two mountains separated, but whether this was caused by an earthquake or not, is not certain.	Kämpfer, v. Dohm, p. 234.
1512	Valley of Palenza in Switzerland.	No shock felt			Bertrand; Collection Académique.
1513. Aug. 17.	Meissen in Saxony	Several shocks		The mountain, shaken by an earthquake, fell with a great noise into the valley below, thereby diverting the course of the river Brenno.	Rivander's Düringische Chronik. Paul Joves, trad. de D. Sauvage, t. i. pp. 218 and 345.
—	A mountain at the foot of the Alps, above Bellizone.				
1514. Jan. 20.	Bâle.				Merian, über die in Basel wahrgenommenen Erdbeben.
—	Zante	A violent shock			Montgomery Martin, History of the British Colonies, vol. v. p. 431.
1517. June 26.	Nordlingen in Bavaria, and the country for two miles round.			During a violent storm. Produced great ruins.	Lycosthenes; Fincelinus, lib. iii.; Münsteri Cosmograph. Univ. lib. iii.
1519	The lowervale of Djan-dul, one of the valleys of Cabul in Afghanistan.	A violent earthquake.			Berghaus's Annalen der Erdkunde, quoting Sultan Baber's Memoirs.
1520	Ragusa				Partsch, Detonations-Phänomen zu Meleda, p. 188.
1521	Milan				Grundriss der Geschichte der Natur, lib. ii.; Fucinus.
—	Milan				Huot, Cours de Géologie, t. i. p. 110; v. Hoff.
1522	Bâle				Merian, über die, &c. loc. cit.
—	Angers.			During an eclipse of the moon. There were two lunar eclipses this year, namely on the 12th March and 5th September.	Philippi Bergomat. Suppl. Chron. fol. 437.

Dec. 27.	at Yverdun in the Pays de Vaud.	Three shocks	Berghaus in his preface to v. Hoff, quoting Merian, gives the date 28th Dec.	Ditto.
—	—	Many shocks	—	v. Hoff.
1524.	Different points in the kingdom of Naples.	Ditto	—	Ditto.
April 22.	Grenada in Spain	Several shocks.	The French authors use the expression "un tremblement de terre <i>avait pensé renverser la ville.</i> "	Merian, <i>loc. cit.</i>
Sept.	Angers	—	—	Chron. Nic. Gellen; Mézerai; Philippi Bergomat.
1528	Mayence	Ditto	—	Fr. Nausee; Biancicampiani, de precipuo lujus anni 1528 apud Moguntiam terre motu Responsum, 4to, p. 25.
1529.	Bâle	—	—	Merian, <i>loc. cit.</i>
Sept. 11.	Coast of Paria and Curiana, near the island of Cubagua, South America.	The sea rose four fathoms and sank again.	The earth opened in several places, and black fetid salt water and asphalt came out. A mountain at the side of the gulf of Cariaco remained cleft. A fort and many houses were destroyed.	Humboldt, Voyage aux régions équinoxiales, t. ii. p. 272; Hist. des anciennes Rév. du Globe, p. 267.
1530.	Sept. 1.	—	—	—
—	About Flanders, Holland, and Zealand.	During an inundation	Accompanied by heavy rain, thunder, and lightning.	Taragnotta, Hist. del Mondo, t. v. fol. 69.
Oct. 10.	—	—	—	—
1531.	Jan. 26.	At Lisbon there were extremely violent shocks seven or eight times a day for eight days.	In Lisbon 1500 houses and all the churches were thrown down. v. Hoff does not seem to think that the shocks in Flanders occurred at the same time with the rest. Tavares gives the date Jan. 1. The Coll. Acad. says that earthquakes were very general the whole of this year and the next.	Turquet, Hist. d'Espagne, p. 1482; Collection Académique; Lycosthenes; Palmer; Naucner; Goldwurm, &c.
—	—	—	—	—
Begin- ning of the year 1532	Bâle	Another violent earthquake.	Some houses were thrown down	Bertrand; Collection Académique.
1532	—	—	—	Lycosthenes.
March 7.	—	Very violent	—	—
1533.	Nov. 25	Several shocks.	Caused but little damage. The course of a river in Thurgovia was altered. The whole year was very stormy in Switzerland. Others give as the day of the month the 9th.	Bertrand; Collection Académique.
—	—	—	—	Chron. German. u. Contin. Sleidani.
of 26.	Throughout Switzerland, principally at St. Gall, the lake of Constance, and Neuchâtel.	—	—	—

1.	2.	3.	4.	5.	6.
1533. Dec. 27. Bale	in Italy	Three shocks			Lycosthenes; Merian, <i>loc. cit.</i>
1534. Oct. 22. Zurich and the neighbourhood.		Several shocks.		v. Hoff gives the date 11–12 Oct. (O. S.), and says that it was felt at Baden, Bremsgarten, Mellingen, Bruck, Windisch and Königsfelden. Followed by a violent storm in the cantons of Zurich and Lucerne. Ragor says that he himself was born at Windisch during this earthquake.	v. Hoff. Bertrand; Coll. Acad.; Ragor.
1536	Valley of Mazaria in Sicily.			The earth opened, and a little town was swallowed up. On the 23rd March of this year an exceedingly violent eruption of Etna began, and lasted until the middle of April. Accompanied by subterranean noises like thunder. On the 11th Etna burst into eruption.	Fazelli, p. 212.
1537. May 1 to 13.	Naples, and throughout the whole of Sicily.	Slight shocks			Fazelli, p. 55; Collection Académique.
— Sept. 26.	Pozzuoli near Naples	Ditto, continuing slightly the whole of this year and the next.			Diarium Hist. p. 292.
—	Bale	Several shocks.			Merian; Collection Académique.
1538. Jan. 20 or 28.	Ditto			Both at Bale, and throughout the canton, igneous meteors were seen after the shocks.	Bertrand; Coll. Acad.; Merian.
— Sept. 27 and 28.	Pozzuoli, Naples, and all through Calabria.	Almost continuous shocks for these two days. More than twenty violent ones. All, however, ceased as soon as the eruption began.	The sea retired many paces from the shore.	On the 29th at about 2 o'clock at night, Monte Nuovo was raised, and afterwards entered into eruption.	Maria della Torre, Storia e fenomeni del Vesuvio, p. 61; Hamilton; Pietro di Toledo; Kircher, Mund subt., and many other authorities.
—	Quito and the country round.	Very violent		Followed by an eruption of Ruchu Pichincha	Hist. Gén. des Voyages, t. xix. p. 82; v. Humboldt, Ideen zur geogr. u. s. w. der Tropenwelt, p. 51.
1539. June 27. 7 P.M.	The Saxon Erzgebirge, and some other parts of Germany.			Lycosthenes mentions Chemnitz as having experienced this earthquake, and gives the date 25th June, 1540.	Agricola, Mineral-Schriften, Teutsch. übersetzt, t. ii. p. 209; Chron. German.
1540. July 18.	Bale			Lycosthenes gives this date, but it should probably be 1539.	Merian.
— Dec. 14.	In Germany, probably as before in the Erzgebirge.				Lycosthenes.
1541. End of Oct.	Algiers			Accompanied by a violent tempest	Collection Académique.

On 12 or 13. Dec. 12. 23rd hour.	Constantinople. Sicily, Italy, and Turkey; especially in Sicily.			Syracuse, Leontium, Calatagrona, Catania, and several other towns in Sicily were ruined. The fountain of Arethusa and the wells of Syracuse for some days gave forth water more salt than usual.	p. 560; v. Hoff. Fazelli, pp. 71 and 567; Huot, p. 110; Goldwurm; Coll. Acad.
—	Mexico.				Memoir of M. Perrey on the earthquakes of Mexico and Central America.
1544. Jan. ...	Calabria		Violent shocks	Many houses were almost destroyed.	G. Fiore, <i>loc. cit.</i> p. 287.
1545. Sept. 6.	Throughout Europe			Probably the same with the last	Mémoires de Chronologie, t. ii. p. 915.
1546	Mechlin, Brabant, &c. In Palestine.			Joppa, Sichem, and Rama were especially injured. The bed of the Jordan remained dry for two days (?).	A pamphlet in the British Museum. Rivander, in suo promp.
1548. Feb. 9. After 4 A.M.	Bâle		A slight shock.	The shock awoke Lycosthenes, who says that he felt as if his bed were raised up by some other person.	Lycosthenes; Bertrand; Coll. Acad.
1549. Mar. 12.	Brussels		Two shocks		Communication of M. Quetelet to M. Perrey.
— May 31.	In Calabria				G. Fiore, p. 287.
1550	In the kingdom of Naples.		Disastrous shocks	Ariano was swallowed up. The same year (possibly at the same time) there was an eruption of Vulcano in the Lipari Isles.	Philip. Bergomat., p. 368.
1551. Jan. 26.	At Naples		Several shocks.	200 houses thrown down. Preceded by a remarkable aurora borealis.	Mém. de Chronol. t. ii. p. 915. Lycosthenes; Frytchius.
— 28.	Lisbon			Kitchen utensils and other moveables were thrown from their places.	Strype's Memor. Eccles. vol. ii. p. 272; Collec. Acad.
— May 25.	Rygate, Croydon, and Darkin, in Surrey; especially at Darkin.		Many shocks		Fincelius and Rivander.
1552. Mar. 6.	The Saxon and Bohemian Erzgebirge; especially at Freiberg, Joachimsthal, Eger, Bucha, and in Lussace.		Several shocks.		
— April 20. At twilight.	In the chain of the Sudetes, as at Meissen and Freiberg.				Lycosthenes.

1.	2.	3.	4.	5.	6.
1552. Sept. 16. 6 P.M.	Bâle and the Valais. Also felt in Hungary, according to the Mém. de Chronol.	Slight			Lycosthenes; Bertrand; Collection Académique.
1553. Aug. 17. Between 7 and 8 P.M.	In the basin of the Elbe; principally at Meissen in Saxony.			Ruined some buildings	Lycosthenes; Eberus; J. Aug. de Thou, Hist. t. i. p. 409 (fol. edit.).
1554. Mar. 21. Midnight.	Belgium. (The author who reports this lived at Louvain.)	One violent shock		Accompanied by a subterranean noise like bellow- ing, and a brazen sound (genus clangor) like the noise of many chariots in rapid motion. Vessels placed in elevated positions were thrown down.	Cornelius Gemma, De Nat. Div. Caract. lib. ii. p. 23.
— 22. 4 P.M.	Ditto	Two violent shocks.			Ditto.
— Apr. 30. 5 P.M.	Ditto	Three consecutive shocks.			Ditto.
1555. (In the second month of the Chinese calendar.)	In the provinces of Chan-si and Honan in China.				De Mailla, Hist. gén. de la Chine.
1556. Jan. 15.	Strasbourg.				
— 24.	Bavaria, Austria, in the Windischmark, Hun- gary, Croatia, Dalma- tia, and Moravia.	The shocks lasted for four days.		Twenty-six townships (Ortschaften) were ruined.	Pauli Eberi calendarium historicum. Ditto.
— April 1. 11 P.M.	Province of Chan-si in China.	Lasted two hours. Ex- tremely violent.		According to v. Hoff, a piece of ground of sixty leagues in circumference was sunk by this earthquake, and a lake produced in its stead. Very many people lost their lives.	De Mailla, Hist. gén. de la Chine, t. x. p. 321.
—	The town of Rossana (Rossana Astropie), and the country round for a distance of thirty miles.	Very violent shocks		All the fortifications of the town were ruined. v. Hoff, quoting Bernherz, places this event in May, in connexion with the following account.	Lycosthenes.
— May 10. 2 hours be- fore dawn.	Constantinople	Very violent		Frytschius gives the date 10th March, and says that it lasted three days, doing great damage to houses, &c.	Eberi calendarium historicum.
—	Japan				Kämpfer, v. Bohm, t. i. p. 120.
1557. Apr. 24.	Zurich and Winterthur. Also in the Canton de Vaud, at Yverdon.	Several shocks.		Accompanied by much noise, but little damage.	Bertrand; Collection Académique; Scheuchzer.

1558. Apr. 13. Siena, Florence, and other parts of Tuscany.	Very violent		The water (fontain?) of Fontebranda rose three times to the height of more than two fathoms.	t. xi. p. 96. Libro di Mem. delle Monache del Santuccio.
1559. May 17. Thuringia.	Very violent		Followed by disastrous inundations	Frytschius.
1559. Aug. 25. Val di Diano (Calabria?)	Very violent		Did considerable damage	G. Fiore, <i>loc. cit.</i> p. 287.
1560. Dec. 13. Cattaro, not far from Ragusa.				Dogliani, p. 655.
1560. Dec. 13. Vienna			Accompanied by a violent storm, with thunder and lightning, and by a noise like that of a carriage in motion.	Epit. rer. gest. sub Ferdin. I, imper. p. 2168.
— 27. Zurich	A feeble shock		Followed, the same night, by an aurora borealis of great brilliancy, seen not only at Zurich, but all over Germany. The evening before, in the Duchy of Wurtemberg, a piece of land of twenty feet square suddenly sank to the depth of thirty-six feet, and water then rose at the bottom to the height of nine feet.	Scheuchzer, p. 74.
1561. ....	Several violent shocks		Many buildings thrown down, and the courses of streams altered.	Frytschius.
1563. Jan. 17. In Belgium, probably at Louvain.			Accompanied by thunder and wind, and followed by great rains.	Corn. Gemma, <i>loc. cit.</i> p. 41.
— June 13. Cattaro, not far from Ragusa, and the villages round.			Did great damage both to this town and others.	S. Schard, t. iii. p. 2201; P. Justiniani Hist. Venet. p. 310; v. Hoff.
— In Illyria	Violent		Probably simultaneous with the last.	J. Aug. de Thou, Hist. t. ii. p. 381.
1564. July ... At Nice, and in Provence			Accompanied by loud claps of thunder. Seven villages were destroyed.	Gazette de France of the 24th Jan. 1772; Mém. de Chron. t. ii. p. 915; Mém. de Turin, t. xix. p. 158.
1565. Feb. In Hundsruken, on the Moselle, and on the Rhine.	Several shocks.			Chron. Univers.
— Night between 7 and 8. Bâle.	Violent shocks.			H. C. Wieland's MS. Chronik, 1684.
— Neighbourhood of Nice			Some hamlets were swallowed up by the earth	Nigrin's continuation of Richter's Chronik, Frankfurt, 1598.
— Guatimala, especially in the neighbourhood of the volcano Paríya.			Accompanied by an eruption of the volcano	v. Humboldt in der Hertha, Bd. vi. S. 138; v. Buch, Descrip. des îles Canaries, p. 510.



1.	2.	3.	4.	5.	6.
1568. July 26. At Meissen .....					Georg. Fabricius.
At night.					
1569. Apr. 16. Berne .....		A slight shock.....			Benedict Martin.
(A.M. OR P.M.?)					
May 14. Louvain .....		Two hours and forty minutes later, there were two other shocks felt consecutively, of which the latter lasted three or four minutes.		Accompanied by a hoarse noise. Gemma says of the first shock, "ferebant tum temporis et spectra ruina in aëre pervagata." And of the second, "colores tum in aëre vidi varios, inusitata specie, valde terribiles."	Corn. Gemma, <i>loc. cit.</i> p. 64; Coll. Acad.; v. Zach, <i>Corresp. astron.</i>
Midnight.					
Aug. 6. Bâle.....		A slight shock.....			Wieland's Chronik.
Dec. Constantinople .....		Violent shocks, but lasting a very short time.			Coll. Acad.
Night between 13 and 14.				Probably simultaneous with the last.....	P. Justinian, <i>loc. cit.</i> p. 326.
	In different places, principally in the island of Cyprus.				
1570. Nov. 17. Venice, Ferrara, Florence, Modena, Reggio, and all the adjacent country; especially at Ferrara.		Daily shocks for the time mentioned, and recurring at intervals for a whole year. In the first three days there were 84, of which 36 were very violent.		Great damage done to buildings at Ferrara .....	S. Schard, t. iii. p. 2462; P. Justin. Hist. Venet. p. 336; J. Aug. de Thou, Hist. t. ii. p. 777.
Dec. 6. Strasburg, and Spire.....		Several shocks.....		Inundations of the Rhine and Rhone .....	J. Aug. de Thou, Hist. t. iii. p. 36. Acta Eruditorum, an. 1686, p. 517.
	In the Grecian Archipelago.				Coll. Acad.; v. Hoff quotes Molina.
	St. Jago in Chili, extending over a very large tract of country.		The sea retreated some leagues (?) from the coast.	Great landslips took place from the mountains.	
1571. Feb. 17. Kinnaston, near Marcle hill, Herefordshire. Also in Belgium.				A vast landslip took place, the motion continuing from the time mentioned (on Saturday) until the Monday evening following. The place of ground moved was 400 perches long by 160 wide (containing twenty-six acres), and about thirty feet deep. It moved about forty paces.	Baker's English Chronicle, p. 419; De Larray, Hist. d'Angl. t. iii. pp. 218 and 378; J. Aug. de Thou, Hist. t. iii. p. 88; Coll. Acad.; Phil. Trans. 1780.

1571. Feb. 19. Bâle, Strasbourg, and all Violent shocks Between 8 through Alsace. and 9 A.M.			The season was early, the winter cold, and the summer very hot. On the 12th, 13th, 14th, and 15th, aurore boreales. Scheuchzer gives the date 1572.	Huot, Géol.; Hondorf, Theatrum historicum.
— Mar. 5. Constantinople, and the country for four miles round.				Beuther.
— Nov. 1. Inspruck				Collection Académique.
— Tuscany and Lombardy.	Continuation of the shocks of the year before.			
— Island of St. Michel, Azores.				
1572. Jan. 6. In Prussia			Threw down a mountain in the island	Prevost, Hist. gén. des Voyages, t. i. p. 325; Raspe, De nov. insulis, p. 111.
9 P.M.			Accompanied by the fall of aérolites.	Rer. German, S. Schard, t. iii. p. 2509.
7 A.M.	28. Inspruck. Also, about the same time, at Mu- nich and Augsburg.	Shocks lasting three days at Inspruck. Those at the other places were less vi- olent.	Caused some damage to buildings. v. Hoff gives as date the 22nd Jan.	Ditto and Franck. p. 968.
— In Switzerland; especial- ly at Lausanne, Aigle, and the Haut-Valais.	Many slight shocks			Bertrand; Scheuchzer; Coll. Acad.
1573. Sept. 20. Zurich and the adjacent country.				Bertrand; Coll. Acad.
— Dec. 20. Ditto				Scheuchzer.
— 21. The whole of the canton of Glaris.			Accompanied by subterranean noise, and followed by some damage to houses, &c.	Bertrand; Collection Académique.
1574. Feb. 26. York, Worcester, Glou- cester, Bristol, Here- ford, and the neigh- bouring counties.	Very violent		At Tewkesbury and some other places plates and books were thrown from their places. The people who were on their knees in the chapel of Norton, were almost all thrown down. A part of Ruthen Castle was ruined, and the bell in the market house of Denbigh sounded two strokes.	Stow's Chronicle, p. 679; Coll. Acad.; Rév. du Globe.
— Between 5 and 6 P.M.				
— May 3. Geneva and the neigh- bourhood.	Several shocks		The town gate of Cornevin was thrown into the fosse.	Spon, Hist. de Genève, t. i. p. 521; Bertrand; Coll. Acad.
— June 30. Zurich and the neigh- bourhood.	Many shocks			Bertrand; Scheuchzer.

1.	2.	3.	4.	5.	6.
1574. July 30. Bale.	Bale.	One shock		The walls of the town were much cracked	Wieland's Chronik. Beuther.
1575. April 24. Geneva.	Offenburg. (In Baden, or in Transylvania?) Geneva.				Spon, Hist. de Genève, t. i. p. 521; Bertrand; Coll. Acad. Tavares, in Balbi, Essai sur le Portugal, t. i. p. 102. Collection Académique. Baker's English Chronicle, p. 420.
— July 27. Lisbon	Lisbon	Violent		Caused no injury to buildings	
—	Laybach in Carinthia		The tide ebbed and flowed twice within an hour.		
—	The Thames at London				
—	The district of San Salvador in Mexico.	Disastrous earthquake.			Ennery et Hirth, Dict. de Géogr. t. iv. p. 508. Ryffische Chronik (1514–1584). Ditto, and Wurstisen's Chronik; Bertrand; Coll. Acad. Bertrand; Coll. Acad.
1576. Oct. 21 and 22.	Bale.	Several shocks.			
— Dec. 20 and 21.	Ditto	More shocks		Accompanied by very intense cold	
1577. Feb. 27.	Ditto. Alsofeld at Geneva, and in the Pays de Vaud.	One shock			Ragor.
— Sept. 22. Bale, and all through Between 2 Switzerland, especially at 3 A.M., in the Pays de Vaud, at 5 P.M., Aigle.		Three shocks at the times mentioned; the second less violent than the first, and the third, according to one of M. Perrey's memoirs, more violent, and according to another, less so, than the second.		All through the course of this year many shocks were felt in different places in Switzerland.	Bertrand; Stumpf's Schweizer Chronik.
— 23. Ditto					Ragor.
— 24. Ditto					Ditto.
— 29. Ditto					Ditto.
— Oct. 5. Bale.					Ragor; Wieland's Chronik.
— 18. Ditto					Ditto.
— Nov. 30. In Mexico (lat. 13° 32' N.)		"A very remarkable earthquake."			y. Humholdt, loc. cit. t. ii. p. 297.
—	Strasbourg, Hagenu, and the neighbouring places.	Several shocks.		Probably simultaneous with some of the earthquakes at Bale.	Beuther.

1577	Island of Cyprus	Very violent shocks	The people were driven to live in the open country.	Taragnota, <i>loc. cit.</i> t. v. p. 297; Sleidanus, t. iii. p. 63.
1578. (May 18; Whit Sunday) 10 P.M.	Ofen in Hungary		During a storm of thunder and lightning	Bernherz.
June 17.	Peru, especially at Lima			Ulloa, <i>Hist. gén. des Voyages</i> , t. xx. p. 31; v. Humboldt, <i>Voyage</i> , t. i. p. 317. Bertrand.
Sept. 28.	Throughout Switzerland.			
	Most violent at Zurich.		The town was ruined. This same year, or the following, an eruption of Etna.	Ferrari, <i>Campi flegrei</i> .
	Town of Sciaccia in Sicily.			
	Java			<i>Hist. gén. des Voyages</i> , t. ii. p. 401; Radice's History of Java, t. ii. p. 234 and Append.; John Prior's Voyages in the Indian Ocean. Mém. de Chronol. t. ii. p. 915.
1579. Jan. 26.	Tours, Orleans, and Chartres.			
1580. April 6. 6 P.M.	Throughout England, especially at London, Dover, and the whole of Kent. Also in France at Boulogne, Calais, Paris, &c., in Belgium at Brussels, Malines, Cologne, &c., in Zealand, and Holland. Most violent in England.	At London and the environs, the earthquake lasted about one minute. Two others lighter shocks were felt all through Kent, namely, at 9 and 11 P.M.	The great bells at Westminster and other places were made to sound. Portions of several buildings, and very many chimneys were thrown down in London. The heavens were serene, and the air quite tranquil.	Camden, <i>Hist. of Elizabeth</i> , p. 314; De Larrey, <i>loc. cit.</i> pp. 330 and 368; Phil. Trans. vol. xvi. p. 660; Stow's Chron.; De l'Estolle, <i>Journ. de Henri III.</i> t. i. p. 198; J. Aug. de Thou, <i>Hist.</i> t. iii. p. 766.
May 1. Midnight.	County of Kent, especially at Ashford. Also in the Netherlands, as far as Cologne.	Very considerable		Camden, <i>loc. cit.</i> ; J. Aug. de Thou, <i>loc. cit.</i> , and p. 784; Coll. Acad.
	In Spain, the Pyrenees, and as far as Bordeaux.			
or 1581.	In Iceland	Very violent		Mémorial de Chronologie, t. ii. p. 915.
			An eruption of the volcano Katlegias took place about the same time, but whether it was exactly simultaneous with the earthquake or not, is doubtful.	v. Hoff.
1582. May 1.	Naples and Pozzuoli		Some buildings were thrown down	Vivenzio, p. 11.
	In Peru, especially at Arequipa. Also felt at Lima.	Ditto	Arequipa was ruined. v. Hoff mentions an earthquake in this year, in the district of Angoango, Peru, which he thinks may be a distinct one.	Collection Académique.

1.	2.	3.	4.	5.	6.
1583. Jan. 13. — May 5.	Blackmore, Armitage, in Dorsetshire, En- gland. Mans (in France?)			Accompanied by a landslide of more than three acres, which moved about 900 feet. Possibly not a true earthquake.	De Larrey, <i>loc. cit.</i> , p. 378; Cam- den, <i>loc. cit.</i> , p. 366; Stow's Chro- nicle. De l'Estoile, Journal de Henri III. t. i. p. 259.
1584. Mar. 1. Afternoon.	Throughout Switzer- land, Burgundy, Dau- phin, and Piedmont. The town and lake of Gryffensee, two leagues from Zurich, were very violently shaken.	At Geneva the shocks lasted ten to twelve min. They recurred all through the districts here mentioned for at least ten days, there being a violent shock, felt especially at Bale, on the 10th.	The waters of the lake of Geneva were much agitated and raised more than twenty paces above their usual level.	Accompanied by thunder and lightning, which set fire to the church of Saint-Julien. The weather was very fine and serene. Many chimneys, buildings, &c. were thrown down.	Spon, Hist. de Genève, t. i. p. 325; Bertrand; Coll. Acad.; Mém. de Chronol., t. ii. p. 916.
1586. July 9.	Japan leagues along the coast, and 50 leagues into the interior. Most vio- lent at and about Lima.	Several violent shocks	The sea came in four- teen fathoms high immediately after the shocks, and in- undated the country for two leagues from the shore.		v. Hoff v. Hoff quotes Bouguer; Coll. Acad.
— Sept.	Japan	Very violent	The sea inundated the country, carrying away houses with their inhabitants.	The town of Nangasuma was completely ruined. Hills were thrown down, and clefts opened in the earth of such a size, that a musket shot would not reach from one end to the other; and out of these there came an insupportable smell of sulphur.	Kämpfer, v. Dohm, t. i. p. 236; Pater Hay de rebus Japonica.
—	Guatemala			The city of Guatemala was ruined. An eruption of the volcano of Fuego in Guatemala took place at the same time. There were also eruptions in this year in Java and Banda.	v. Humboldt in Hertha, Bd. vi. p. 138; v. Buch; Coll. Acad.
1588. Mar. 25. A little be- fore noon.	From Nantes to Saumur in France. Also, less vio- lently, in some parts of Normandy.			The houses shook, and the waters of the Loire appeared to boil. In Normandy accompanied by a sort of smoke which tinged the air yel- lowish for an hour.	Mézeral, Hist. de France, t. iii. p. 478; De Larrey, Hist. d'Angl., t. iii. p. 529; J. Aug. de Thou, Hist. t. iv. p. 558.
— Nov.	Saalfeld in Thuringia			A cleft opened during this earthquake in the mountain Culon or Culm of 10 feet wide and 100 deep.	Coll. Acad.

[illegible]

1.	2.	3.	4.	5.	6.
1594	Naples and Pozzuoli. Also, according to v. Hoff, in the Canton du Vaud.	Violent shocks.	The sea retired 200 paces from the shore.		Kircher, Mund subter., lib. iv. s. 2. c. 10; Coll. Acad.
1595. Aug. 6.	The town of Meaco in Japan.			The town was ruined by the earthquake. Kämp- fer gives the date 1594.	Dan. Bert., Asia, p. 2. l. ii.; Kämp- fer v. Dohm.
1596. July 22.	Japan.		The sea rose above its ordinary level.	Preceded by a rain of ashes. The towns of Ochinofuna, Famaoqui, Ecuero, Finco, and Cascianoro were ruined.	Zappell, Hist. dell' Incendio, c. 9; Coll. Acad.
1597. Jan. 29. From the 22nd hour to the 1st hour of the night.	Calabria Luciana, and the hills about Pisa.	Three violent shocks Five shocks		Caused no injury.	G. Fiore, <i>loc. cit.</i> "Notizia estratta da una vecchia chronaca di un Parroco di La- ciana."
— July 23.	Perth, and other parts of Scotland.				Thomson's Annals of Philosophy, vol. viii. p. 365.
— — 28.	Lisbon			The houses of three entire streets were thrown down, and the hill of St. Katharine was cleft into two. People walking in the streets were thrown to the ground.	Mém. de Chronol. t. ii. p. 915; Balbi, Essai sur le Portug. t. i. p. 102. Balbi, <i>loc. cit.</i>
1598. July 22.	Ditto			A volcanic eruption in the Isle of Banda took place this year.	Kämpfer v. Dohm, t. i. p. 237.
— — —	Japan	Many shocks during a whole month, some very violent.		Preceded in October by unusually heavy and continuous rains, which caused most disastrous inundations.	G. Fiore, <i>loc. cit.</i>
1599. Nov. 8, 12, 13, and 14.	In Calabria	Very violent shocks		The ground beneath the lake where the Rhone flows out from it, was raised and sunk so as to make the waters of the lake appear to ebb and flow three or four times.	Spon, Hist. de Genève, t. i. p. 417; Bertrand; Coll. Acad.
1600. Sept. 16.	Upper part of the lake of Geneva.			Some houses thrown down Accompanied by darkness as of clouds, and a thick rain of ashes for twenty days.	Ch. Mathias, Theat. Hist. p. 623. Collection Académique.
— — —	Norcia and Florence Arequipa in Peru	Several shocks			v. Hoff.
— — —	The island of Bornholm in the Baltic Sea.				Lerner's Chronik; Kriegel. Vivendo, p. 11.
1601. Feb. 8.	Frankfort on the Maine.	Violent.		Did no damage	
— Aug. 10.	In the kingdom of Naples.	Very great			

Asia. Most violent in Switzerland, Austria, Bohemia, Bavaria, Swabia, Alsace, and part of the Netherlands	sphere was quite calm.	was stopped. Followed in Switzerland by heavy rains, and consequent inundations. It was felt at Haguenau, Strasburg, Spire, Frankfurt, and Cologne, and in Wurtemberg, and Hesse. At Gotha, a steeple was thrown down.	Chronik; Benthier; Krieger, &c.
1602. June 28. Zurich and the neighbourhood. 6 A.M.	Several shocks.		Camden, <i>loc. cit.</i> p. 831.
— Dec. At the end of the month.	Several tremblings		Bertrand; Scheuchzer; Coll. Acad.
1603. Jan 25. Sienna	Terrible earthquakes.		Pilla, <i>Istoria del tremuoto</i> , &c. p. 202.
— Aug. or District of Waradin in Croatia.	Very violent		Archivio del regio Scrittojo, quoted by Signor Pilla.
— In the country situated between the Carpathians and the Eastern Alps.		Probably the same with the last	Claude Malingre, dit de St. Lazare, <i>Remarques d'Estat. et d'Hist. de</i> 1600 à 1632, p. 57.
1604. Apr. 14. Bale			Bertrand; Basler Chronik; Coll. Acad.
Between 9 and 10 o'clock (A.M. or P.M.?)			
— Sept. 16. In Italy	Very great	Caused no damage	G. Fiore, <i>loc. cit.</i> ; Huot.
— Nov. 26. Arequipa in Peru		v. Hoff suggests that this may be only the same with that of 1600, wrongly reported as to date.	Frezier, <i>Reise in die Sudsee in den Jahren 1712-14.</i>
1606		During this earthquake a mountain was raised from the sea in one night, near the rocky island Fatsiao.	Kämpfer v. Dohn, t. i. p. 237.
		Followed by numerous storms	Bertrand.
1607. April 2. Throughout the Canton du Vaud, especially at Yverdon. Also felt at the same time in several other parts of Europe.			
— July 15. At Eberzlingen, near Würzburg.		Threw down a portion of a mountain, and discovered various subterranean abysses, &c.	Claude Malingre, <i>loc. cit.</i> p. 125; Steidanus, t. iii. p. 1308.
1608. Nov. 8. 9 P.M.			Thomson's <i>Annals of Philosophy</i> , vol. viii. p. 365.



1.	2.	3.	4.	5.	6.
1609. Jan. 19.	In the Thames .....	No shock mentioned .....	An extraordinary flux and reflux of the tide twice within an hour.	.....	De Larrey, <i>loc. cit.</i> p. 673.
— June 8.	In the kingdom of Naples.	.....	.....	.....	Vivenzio, p. 11.
— July 20.	Nicastro in Italy.....	.....	.....	.....	Fiore, <i>loc. cit.</i> p. 289.
— Nov. 27.	Lima and Arequipa in Peru.	.....	.....	Caused some damage .....	Coll. Acad.; v. Hoff.
1610. Nov. 29.	Bale.....	.....	.....	Threw down a part of the walls of the town, and was attended with a subterranean murmuring noise.	Bertrand; Baaler Chronik; Scheuchzer; Coll. Acad.
1611. Jan. 15.	In the valleys of Switzerland and Piedmont.	One of the most violent shocks ever heard of here.	.....	.....	Vassali—Eandi, Rapport, &c., p. 126, quotes Gillo, Hist. des Églises Vaudoises, c. 52, p. 385. Edinburgh Encyclopædia, Article Chronology.
— .....	Constantinople .....	.....	.....	This year was remarkable for tempests.....	Mém. de Turin, t. xix. p. 158; Coll. Acad.
1612. Jan. 31.	Nice and the environs. According to the Coll. Acad., in several places in the Mediterranean.	.....	.....	.....	Bertrand; Baaler Chronik; Scheuchzer; Coll. Acad.
— Feb. 29.	Bale.....	.....	.....	Without damage.....	MS. Hist. of Bergen, by Edvard Edvardsen.
— May.	Bergen in Norway .....	Violent.....	.....	.....	.....
Night between 15 and 16.	.....	.....	.....	.....	.....
Nov. 8 to Dec. 7.	Westphalia, and other parts of Germany, especially at Bielefeld, and the castle of Sparenberg. Also felt in the island of Candia, and several places in the Mediterranean.	At Bielefeld and Sparenberg the shocks occurred almost daily during the whole time.	.....	The trees appeared agitated, as if by a high wind, although the air was unusually calm. In Candia many buildings were thrown down, and ships sunk.	Coll. Acad.; v. Hoff; Mercure Français adj. à l'an 1612, p. 3.
1614. Feb. 14.	Waradin in Transylvania, and the neighbourhood.	Very violent .....	.....	Men and other animals could not remain standing.	Mercure Français, 1614, p. 571.
— 17.	Bale.....	.....	.....	Accompanied by a great noise .....	Bertrand; Scheuchzer; Baaler Chronik; Coll. Acad.
At night.	.....	.....	.....	.....	.....

— May 4. . . . . round.	Island of Terceira in the Azores.	Several shocks . . . . .		Ruined the towns Praya and d'Angra . . . . .	Coll. Acad.; Buffon, Hist. Nat. t. ii. p. 312 (edit. of 1750).
— Sept. 24. . . . . After mid-night.	Bâle . . . . .	A terrible earthquake.		Accompanied by subterranean noises as before.	Bertrand; Basler Chronik; Scheuchzer; Coll. Acad.
— Nov. 24. . . . . 4th hour of the night.	Calabria . . . . .				Fiore, p. 289.
1616. . . . . Be- ginning of January.	Neuhäusel in Hungary . . . . .				Bernherz.
— Feb. 20. . . . . Between 3 and 4 A.M.	In Austria, Bohemia, and Hungary; especially at Prague.	Lasted but a short time.		Accompanied by great subterranean noises, but without causing any damage.	Ditto.
— . . . . . Japan . . . . .		Violent.			Kämpfer v. Dohm, t. i. p. 238.
1616. Jan. 12. . . . . 4 P.M.	Naples . . . . .	A slight shock . . . . .			Vivenzio, p. 11.
— March. . . . . Beginning of the month.	Different parts of Switzerland.			Many buildings, &c. thrown down . . . . .	Claude Malingre, loc. cit. p. 251.
— July 28. . . . .	At sea, at the entrance of the Straits of Le-Maire.		Felt by Le-Maire, the discoverer of these Straits.		Hist. gén. des Voyages, t. xvi. pp. 73 and 107.
— Aug. 2. . . . .	Aleppo . . . . .	Very violent . . . . .		The walls were shaken like the leaves of a tree.	Pietro della Valle, Voyage en Syrie, t. ii. p. 152.
— Sept. 7. . . . .	Naples . . . . .	Slight . . . . .			Vivenzio, p. 11.
— . . . . . Japan . . . . .		Very destructive . . . . .			Montanus, Japanische Gesandtschaft, p. 205.
1617. . . . . July 5.	Freiburg in the Brisgau . . . . .			During this earthquake a great mass of rock fell upon a house and ruined it.	Bertrand; Scheuchzer; Coll. Acad.
— . . . . . Aix in Provence . . . . .					Basler Chronik; Coll. Acad.
1618. . . . . June 4.	Sardinia; especially at Cagliari.			According to the Journal Encyclopédique of the 15th Sept. 1771, the date of this event should be 1610.	Le Chev. Albert de Marmora, Voyage en Sardaigne de 1819 à 1825, p. 141.
— . . . . . July 3.	In Bearn, at the foot of the Pyrenees.	Two violent shocks.		Steeple were shaken, and the bells made to toll.	Palassou, Mém. sur les Pyrénées, p. 261.
— . . . . . Between 5 and 6, or 7 A.M.					

1.	2.	3.	4.	5.	6.
1618. Aug. 25. At night.	Throughout Switzerland, in the Pays de Vaud, the Valtelline, &c.			In the Grisons a mountain called Conto fell, and ruined a village; 1200 persons losing their lives. Neufchatel was considerably injured. Ignéous meteors were seen soon afterwards.	Bertrand; Scheuchzer; Coll. Acad. Also the treatises of Barthol. Anhornius and J. Gross on this particular event.
1619. Jan. 5. Between 19. and 7 A.M.	In Calabria To the west of Frankfurt on the Maine, at König- berg, Kronberg, Reifen- berg, as far as Hoppart, St. Goar, and Ober-Wesel. Also at Neufchatel.	Very violent		Did much damage in various places The little river Nidda, not far from Frankfurt, ceased flowing. The Coll. Acad. gives the date Jan. 26 for the first-named places, and Jan. 29 for Neufchatel.	Flörke, <i>loc. cit.</i> p. 289. Sleidanus, p. 564; Lerner; Kriegk.; Bertrand.
— Feb. 4. Shortly before noon.	In Peru, for a space of 160 miles long (and how wide?); especially at Truxillo.	The shocks lasted fifteen days.			Montanus, <i>Japanische Geandtschaft</i> , p. 77.
— July...	Iceland	Shocks continuing until September.		An eruption of Hecla at the same time.	v. Hoff.
1620. Jan....	Canton of Berne, especially at Frutigen, and extending as far as Geneva.				Bertrand; Collection Académique.
— Dec....	Geneva.				Ditto.
1621. May 20. During sermon.	Austria. At Bâle and Neufchatel, in the Canton du Vaud, at Geneva, and in Savoy. Laybach in Carinthia Gonahpee in the island of Banda.	Several shocks		At Neufchatel several chimneys were thrown down.	v. Hoff. Spon, <i>Hist. de Genève</i> , t. i. p. 486; Basler Chronik; Bertrand; Coll. Acad.
1622. March.	In Upper and Lower Engadine (in the Grisons), Laybach in Carinthia Province of Sioumie in the Caucasus.			Accompanied by a volcanic eruption.	Collection Académique. Purchas, <i>Pilgrimes</i> , 5. 1. p. 697.
1623. Feb. 20. to 25.	Throughout the Valtelline, especially in the commune of Pergell in the Grisons; and at Clèves (probably Cle-	Many shocks each night for the time mentioned.		Followed by some thunder and lightning.	Bertrand; Coll. Acad.
					Collection Académique. Chakathouno quotes Aroquel of Tauris, <i>Hist. c.</i> 21 and 22.
				The mountains Septimer and Major were so shaken, that pieces of rock were detached from them, and rolled down. During the summer red rain was remarked at many places in Germany and Switzerland.	Bertrand; Scheuchzer; Coll. Acad.

Nov. 29. In the Palatinate.....	quakes then re- membered in Nor- way.	Probably only the same with that mentioned. Hoff. the following year, on the same day and month.	
1624. Feb. 3. In Calabria ..... About the 15th hour. — Mar. 21. Argenta, near Ferrara.....	Very violent. Lasted the time of saying one Ave Maria.	Three churches and more than 130 houses were thrown down. The Dreadner gelehrte An- zeiger, 1756, No. 2, places this event in the year 1625. Caused no ruins	Fiore, <i>loc. cit.</i> p. 289. Mercure Français, an. 1624, p. 185; Huot; Coll. Acad. Mercure Français, <i>loc. cit.</i> ; Coll. Acad.
— Begin- Rome ..... ning of sum- mer.			
Nov. 29. In the Palatinate:.....	Several shocks		Dreadner gelehrte Anzeiger, 1756, No. 2. Collection Académique.
— St. Michel in the Azores .....		A new island, of a league and a half long, was raised during this earthquake near St. Michel.	Bertrand; Collection Académique; v. Hoff.
1625. Feb. 22. Different parts of Swit- zerland. Also, ac- cording to v. Hoff, in Budjadingerland. (In Sweden?) District of San Salvador in Mexico.	Very sensible		Enery et Hirth, <i>loc. cit.</i> v. Hoff.
1626. Jan. .... Feb. 22. Elbermannstadt in the district of Bamberg, duchy of Oldenburg. Also felt the same day at Sirifalco in Cala- bria, which town was ruined.	Disastrous <i>1870 annie</i>	Probably the same with the earthquake in Swit- zerland of the preceding year. v. Hoff gives it in that year, without, however, specifying the month or day.	Huot, Cours de Géol. t. i. p. 110.
Mar. 27. In Calabria ..... 19th hour. — 30. Ditto .....	Moderate. Three shocks		Fiore, <i>loc. cit.</i> , p. 289. Ditto.

2.	3.	4.	5.	6.
April 4. In Calabria .....	Very violent shock. Lasted the time of saying an <i>Ave Maria</i> . Followed by 15 other shocks on the same day, and by others at intervals until October. Many violent shocks, lasting altogether forty days.	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	Catanzaro in particular was much injured .....	Fiore, <i>loc. cit.</i> , p. 289.
May ... Ditto .....	The shocks lasted five hours. The places most injured lay in a line running N. and S. from the eastern side of the Apennines at Bovino to the Adriatic Sea, at the mouth of the river Fortore. The shocks continued at intervals up to the 7th August.	Thirty towns and villages are mentioned as having been ruined more or less by this earthquake, and 17,000 persons lost their lives. Clefts opened in the ground, lakes were dried up, mountains cleft, forests overthrown, and jets of water and mud thrown out of the wells. The shocks were accompanied by subterranean noises, and a smell of sulphur. v. Hoff, Huot, and Gaultier give the date 1627.	The towns of Girifalco and Catanzaro were ruined. Many clefts opened in the earth. Vulcano in the Lipari Isles was in eruption.	Vivenzio, p. 11; Terra tremens.
July 30. In the provinces of the Capitanata and Puglia, and in the city of Naples. Also extended as far as Ragusa and Smyrna.	Lasted a quarter of an hour. Very violent shocks.	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	The towns of Girifalco and Catanzaro were ruined. Many clefts opened in the earth. Vulcano in the Lipari Isles was in eruption.	Coll. Acad.; Mém. de Chronol.; Langlois, Dict. de Géogr. t. i. p. lxxi.; Anton. Foglia, Istoria del gran terremoto, &c., Napoli, 1627; and Vera relazione, &c.; Theatrum Europæum, t. i. p. 1064.
Aug. 7. Ditto, with the exception of Smyrna and Ragusa, which are not mentioned.	Lasted a quarter of an hour. Very violent shocks.	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	Ditto.	Ditto.
— 8. Ditto .....	Lasted a quarter of an hour. Very violent shocks.	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	Ditto.	Ditto.
— 24. Ditto .....	Slight.	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	Ditto.	Ditto.
Sept. 6. Ditto .....	Very violent .....	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	Ditto.	Ditto.
Laybach in Carinthia ...	Laybach in Carinthia ...	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	Ditto.	Ditto.
Luzon, one of the Philippine Isles.	Luzon, one of the Philippine Isles.	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	Ditto.	Ditto.
The island of St. Michel in the Azores.	The island of St. Michel in the Azores.	At Fortore and San Nicandro the sea retired more than two miles from the coast, and then returned again, inundating the country.	Ditto.	Ditto.

Collection Académique.  
Collection Académique.

Raised an island of more than a league and a half long, in 150 fathoms water, near St. Michel. Hence probably confounded with that before mentioned in 1624.

1629	Denmark. China In La Puglia. Also in Africa.	One shock			violent thunder-storm. 7000 persons perished in La Puglia	1628, p. 167. Giac. Calderto, Tab. Geograph., &c. Collection Académique.
1630, July 5.	Bale	One shock			The weather was unusually cold	Bertrand; Coll. Acad.; Merian quotes the Chronicle of Joh. Jac. Scherer.
—	Mecca (Medina?)				Threw down many houses, and the mosque where Mahomet was interred. Followed by a volcanic eruption, and rain of ashes.	Gautier, Table Chronog. p. 869; Lettres Hist. et Polit. t. xiv. p. 262; Gautier, loc. cit.; Coll. Acad.; Mercure Français, an 1630, p. 506, et suiv.
— Sept. 2.	St. Michel in the Azores.					Coll. Acad.; v. Hoff.
Two hours after mid-night.						Bertrand; Coll. Acad.; Wieland's Chronik.
— Nov. 27.	Lima in Peru	Violent shock			The earth opened in different places	Collection Académique.
— Dec. 25.	Bale					
—, or 1631.	Banda-Nera in the Moluccas.				The sea overflowed its shores.	Ferrara, Campi flegrei della Sicilia.
1631. Aug. 24.	Sicily; especially the town Naso.					Della Torre, pp. 62-66; Mercure Français, an 1631, p. 67; Gautier, loc. cit., p. 870; Dulac, t. iv. p. 390; Coll. Acad.; and several treatises on this particular event, quoted by v. Hoff.
— Dec. 16.	In and around Naples, and all the country near Mount Veavius.	About twenty shocks on the day mentioned.			Followed by the greatest eruption of Veavius since the year 79. Brusoni and Sansovino give the date 1630.	Ditto.
During the night.						
— 20.	Ditto	Five more shocks. From this day until the 15th January following they were almost continuous.			Accompanied by a fresh outburst of Veavius	Ditto.
1632. Middle of February.	Bergen in Norway, and the environs.	Many more shocks			The church trembled, and those present felt themselves raised into the air.	Hist. de Bergen, by Edvard Edvardsen.
During the evening of the 15th.						
1633. Feb. 21 and 22.	Village of Nicolosi at the foot of Etna.	A very violent shock			Destroyed a great part of the village. Followed the year after by a great eruption at the same side of the mountain.	Ferrara, Campi flegrei; Mascolo; Carrara.

2.	3.	4.	5.	6.
July 30. Constantinople and the adjacent country.				Mercure Français, an 1633, p. 752.
Nov. 5. Mantua .....	One shock .....			Magnati, pp. 207 and 230.
..... Naples .....	Several more shocks .....			Coll. Acad.
..... In the Haut Valais .....				Bertrand; Coll. Acad.
..... Chili .....				Relacion del Cile de Alfonso di
..... Egypt .....	Several shocks .....			Oraglia, lib. vii. c. 22.
				Collection Académique.
Middle All the country on the south side of Etna.	Many shocks .....			Coll.
tember. ....				Ferrara, Campi Aegrei; Carrera, &c.
..... Laybach in Carinthia .....				
..... In the valley of Mexico .....	Numerous and violent shocks.			Collection Académique.
Aug.... Catania and Messina .....	A slight shock only .....			Humboldt, New-Spain, t. ii.
..... Island of Rhodes .....	Violent .....			p. 102.
Jan. 25. St. Michel in the Azores.	Lasted eight days .....			Ferrara quotes Carrera.
				Hachchi Chalifa.
				Collection Académique.
Sept. 30. Island of Zante .....	Several shocks .....			
9 P.M. ....				Pallavicini, Succesi del
Midnight. ....				Mondo ad ann. 1636; Dresden
Oct. 1. Ditto .....				gelehrte Anzeiger, 1766, No. 5.
Evening. ....	More shocks .....			
— 2. Ditto .....				Ditto.
..... Schlestadt in Lower Alsace.	Violent shocks for 8 days, daily, at the following hours, 7 P.M., midnt., 7 A.M., & noon .....			gel. Ann. see. ed.
				Collection
				Collection
..... Venice .....	Some slight shocks .....			Hoff.
Jan. 18. Calabria .....				see. ed.; Ferrara; Kircher,
the end .....				Mund. subter. t. i. p. 240; Mer-
urb. ....				cure Française, an 1636, p. 482;
				Gaultier; Richard; Labbe, &c.

1638. Mar. 27. In the two Calabrias, and the adjacent part of Sicily. The earthquake extended over a line of about 25 geogr. miles long, from Reggio to Terranova, running about S.W. and N.E.	One of the most violent earthquakes ever experienced here. Several shocks.	At Pizzo the sea retreated 2 miles from the coast.	Accompanied by subterranean noise. 180 towns and villages were more or less ruined. The earth opened in many places, and at Vibona flames came forth. The direction was nearly parallel to that of the earthquake of 1626.	Ditto.
— Canton of Uri, at Bel- linzona (Tein), and some other places near Calabria and Sicily	Several shocks.			Bertrand; Coll. Acad.
— April ... Calabria and Sicily	Several slight shocks.			Fiore; Ferrara, &c. before quoted.
— May 3. Calabria and Sicily	Violent shocks, recurring for eight days.		Some other shocks were felt here during the spring and autumn.	Mem. del Macchi scrittore dello Spedale.
— June 2. New England	Slight ... shock. Direction N.W. to S.E. Followed by a slighter one in less than half an hour.		Preceded by a noise like prolonged thunder. Houses were thrown down, and people were unable to keep their feet.	Fiore; Ferrara, &c. as before. Phil. Trans. for 1757, pt. i. p. 9.
— 8. Calabria and Sicily	Several more shocks.		Did a good deal of damage at several villages.	G. Fiore, and the other authors before quoted.
— End of the year.	Several shocks.		Did great damage. Accompanied by the smell of pitch and sulphur. The atmosphere was obscured as if by a cloud.	Dresdner gelehr. Anz. loc. cit.
— In the markgrate of Brandenburg.				Berlinische Nachrichten von Staats- und gelehrten Sachen, 1838, No. 19.
1639. In autumn. In southern Calabria, at the same places affected the year before.	Several shocks.			Agazio di Somma.
— Smyrna				Phil. Trans. t. xlviii. p. 820.
— Ragusa				Partsch, Detonations-Phänomenen. v. Meleda, p. 88.
1640. April 4. France, Belgium, and Holland; especially at Brussels, Antwerp, Mechlin, and Namur. Also at Frankfurt, and in parts of Westphalia and Lorraine; altogether a space of about 360 leagues	Three very violent shocks.	The ships in the ports of Holland were very much agitated, although it was quite calm.	Followed at night by luminous meteors	Dresdner gelehrte Anz. loc. cit.; Opera van Helmont, art. terre- tremor, p. 90; Coll. Acad.; Mém. de Chronol.; Brachetii Hist. parti. p. 387.



1.	2.	3.	4.	5.	6.
1640. June 19 to July 18.	Calabria	Many shocks		A place called Vadulato was ruined by a shock at dawn on the 19th June.	Agatio di Somma.
1641. March wards the end of the month. to Aug. 11.	Tahriz, and at the same time at Damascus. In Calabria Constantinople	Very violent A feeble shock		Houses thrown down	Hadschi Chalifa.
—	—	—	—	—	Agatio di Somma. Comitis Bissacioni Vita Sultani Ibrahim.
—	In the Abruzzo			During this earthquake a mountain called Cayre, in the Abruzzo, gave out a quantity of water. Followed by inundations, and a flood in the river Laybach.	Physicalische Betrachtungen über das Erdbeben zu Lissabon, Vorrede. Collection Académique.
—	Laybach in Carinthia			—	—
—	Caraccas and La Guayra			—	v. Humboldt, Voyage aux régions équinoxiales, t. v. p. 5.
—	In Persia. Also felt at Bagdad.	Lasted altogether three days.		In the province Aziron the towns Rikan and Riangasan were ruined.	Physical. Betracht. über das Erdb. zu Lissabon.
1642. Some weeks before Easter.(Easter fell this year on the 20th April.)	In Holland	Several shocks.		Possibly only the event of 1640, wrongly re- ported.	Dreadn. gel. Anz. 1756. No. 8.
— March, April and May. — April 5. In the evening. — Nov. 18.	In Lombardy and Pied- mont. At Leghorn Spire, Worms, Mayence, Frankfort, and Cologne. In the Canton of Neuf- chatel.	Ditto A violent trembling Many shocks Three shocks		Ditto. Probably simultaneous with some of the last- mentioned shocks.	—
— 22 At night. 1643. April 12. At night.	At sea in 3° 46' S. lati- tude and 167° longi- tude (according to Berghaus E. longitude, reckoning from the Peak of Tenerife), in the bay of the Cape of Good Hope in New	Several shocks, the first being the most violent.		Narrated by Abel Tasman	Dreadn. gel. Anz. loc. cit.; Lerner; Kriegk. Bertrand; Coll. Acad. Collection Académique.

1644. Feb. 16.	Laybach in Carinthia, Geneva and the neighbourhood.	Several shocks.		Followed by an abundant harvest.	Collection Académique. Bertrand; Collection Académique.
— April 21.	Bâle.	One shock			Wieland's Chronik; Brombach's Diarium.
— June 3 or 13. 5 A.M.	Geneva.	More shocks			Bertrand; Coll. Acad.
—	Gap in Dauphiny.	A terrible earthquake.			v. Zach, Corresp. Astron. t. vi. p. 46.
—	Nice.	Several shocks.			Ditto.
—	Pottiers.	Several shocks.			Dreadn. gel. Anz. 1756. No. 8.
—	Luçon, one of the Philippine Islands.	Several shocks.			Collection Académique.
1646. April 5. 22½ hour.	Leghorn and the adjacent country. Also, at the same time, at Constantinople.	Lasted, at Leghorn, at the time of chanting a <i>credo</i> (!). It appeared to come from the coast. Slight shocks from this up to the 17th, when there was another rather violent, at the same hour.	At Constantinople the sea rushed in so violently that it threw 136 ships up on the strand.	Chimneys were thrown down. Accompanied by a noise like that of a carriage rolling rapidly along.	"Notizia estratta da carte manoscritte del dott. Vivoli"; Hook, Cours de Géol.; v. Hoff.
— May 31.	In La Puglia, along the Adriatic, to the north-east of the region shaken in 1626.	Many and violent shocks.		Viesti, Rodi, Cagnano, Pieschici, S. Giovanni, and other places at the foot of Mte. Gargano were much injured, and many of their inhabitants killed.	Vivenzio, 1783, p. 23, and 1789, p. 13.
1647. May 4.	In Denmark.				Dreadn. gel. Anz. 1756. No. 8.
—	Bâle.				Wieland's Chronik; Brombach's Diarium.
— 13.	In Chili.			Mountains were in part thrown down.	Kircher, Mund. subter. lib. ii. c. 12. sec. 1; Molina, Essai sur l'Hist. Natur. du Chili, trad. de l'Italian (Paris 1789), p. 20; Suppl. Encyc. Britan.; Coll. Acad.
—	Island of Santorin, and in the Levantine Archipelago.				Acta Eruditorum, 1688, p. 517.
1648. Nov. 23.	Yverdon and the Canton of Neuchâtel.	Several shocks.		Accompanied by high wind. The following winter was very wet.	Terra tremens; Bertrand; Coll. Acad.

1.	2.	3.	4.	5.	6.
1648. ....	Zeng in Dalmatia .....	.....	.....	Threw down a portion of the town walls. Followed by very high wind.	Terra tremens.
—	Luçon, one of the Philippine Isles.	.....	.....	.....	v. Hoff.
1649. Beginning of the Year.	Messina .....	.....	Almost all the vessels in the port were much injured by being dashed against one another.	.....	Hoot, <i>see cit.</i> ; Dredner gelehrte Anz. <i>see cit.</i> ; v. Hoff.
— Mar. 4. A little after midnight.	Bergen in Norway .....	Violent.	.....	.....	Edvardsen's Hist. of Bergen.
— Nov. ....	At Naples .....	.....	.....	.....	Terra tremens.
—	Riot in the States of the Church.	.....	.....	.....	Ditto.
—	Island of Santorin in the Archipelago.	Several violent shocks	.....	.....	Expédit. Scientif. en Morée, part. Géol. p. 272; L'Abbé L., Hist. de Venise, t. xi. p. 422; Raspe de novis insule, pp. 29 and 47.
1650. Jan. 10.	Canton of Berne, Neuf-châtel, and as far as Morges in the basin of the Rhone.	.....	.....	.....	Bertrand; Schencher; Coll. Acad.; v. Hoff quotes Merian.
— Feb. 15.	Bâle .....	.....	.....	.....	Ditto.
— Mar. 15.	Ditto .....	.....	.....	.....	Ditto.
— Beginning of the month.	Island of Santorin .....	Two violent shocks.	.....	A great number of houses injured, and rocks rolled into the sea.	Expédit. Scientif. en Morée, <i>see before quoted.</i>
— May 2.	Bâle .....	More shocks	.....	.....	Bertrand; Schencher; Coll. Acad.; v. Hoff quotes Merian.
— 6.	Ditto .....	.....	.....	.....	Ditto.
— 7.	Ditto .....	.....	.....	.....	Ditto.
— 16.	Ditto .....	.....	.....	.....	Ditto.
— At noon.	.....	.....	.....	.....	Ditto.
— July 11.	Ditto .....	.....	.....	.....	Ditto.
— 4 A.M.	.....	.....	.....	.....	Ditto.
— 26.	Ditto .....	Several shocks.	.....	.....	Ditto.
— Sept. 10.	Berne and the shores of the lake of Geneva, Lau-	Very violent	.....	Preceded, the day before, by a furious tempest, which did great damage.	Ditto.

12. Bâle.....	whole year.			Ditto.	
16. Ditto.....				Ditto.	
19. Ditto.....				Ditto.	
24. Island of Santorin. Also felt in Candia. to Oct. 9.	Numerous and violent shocks, increasing in intensity until the 27th and 29th, when the most violent oc- curred.	Accompanied by a sub- marine eruption a little to the west of the island, which threw up a large bank of sand, not quite reaching to the level of the water. The vessels in the port of Can- dia were dashed against one another.	Accompanied by very loud subterranean noises like bellowing.	Ditto.	Accompanied by very loud subterranean noises like bellowing. Scientif. en Morée, &c. be-fore quoted.
Oct. 9. Bâle.....	Slight shocks				Bertrand; Scheuchzer; Coll. Acad.; Merian.
10. Ditto.....	Ditto			Ditto.	
13. Ditto.....	Ditto			Ditto.	
16. Ditto.....	Ditto			Ditto.	
18. Ditto.....	Ditto			Ditto.	
20. Ditto.....	Ditto			Ditto.	
Nov. 6. Ditto, and throughout the Canton.	Ditto			Ditto.	
9. Ditto.....	Ditto			Ditto.	
10. Ditto.....	Ditto			Ditto.	
13. Ditto.....	Ditto			Ditto.	
16. Ditto.....	Ditto			Ditto.	
20. Ditto.....	Ditto			Ditto.	
..... The seigneurie of Ho- hensau in the canton of Zurich.	Experienced eighteen earthquakes during the year.			Ditto.	
1651. Jan. 8. Bâle.....	Several shocks				Wieland and Brombach.
18. Ditto.....	Ditto			Ditto.	
Feb. 12. Ditto.....	Violent shocks			Ditto.	
..... At and around Etna	Violent shocks			Ditto.	Ferrara, Descrizione, &c. p. 100.
June 8. In Bagadine, in the Grisons.	Several shocks			Ditto.	Kefenstein, Zeitung für Geognosie, &c. S. 297.

1.	2.	3.	4.	5.	6.
1651. June 25.	In Engadine, in the Grisons.	Several shocks			Kerstein, Zeitung für Geognosie, &c. S. 297.
— Aug. 3.	Ditto	Ditto			Ditto.
— Oct. 29.	Geneva.	Ditto			Ditto.
— Dec. 7.	Ditto	Ditto			Sporn, Hist. de Genève, t. i. p. 512; Bertrand; Coll. Acad.
— Between 4 and 5 p.m.					
1652. Feb. 4.	Chili and Peru	Very violent			Dread. gel. Anz. l. c.; Terra tremens.
—	In the canton of Zurich.				Bertrand; Scheuchzer; Coll. Acad.
—	Bâle and Schaffhausen.				Ephém. de Manheim, 1783, p. 685.
— Aug. 1.	Bâle				Merian.
— Dec. 10.	Canton of Neuchâtel	Several shocks during the year.		Merian considers this account as doubtful	Bertrand; Coll. Acad.
—	Canton of Berne.			Followed by a great abundance of snow	Bertrand.
—	Sciaccia in Sicily	Shocks lasting for two weeks.			Ferrara, Campi Segrai.
—	Island of Palma (18 leagues from Teneriffe) and all through the Canaries.			Followed by a volcanic eruption in the island of Langlois, Diét. de Géogr. t. i. p. 60; Palma. [There was also a similar phenomenon this year in the island St. Michel, Azores.]	
—				The Coll. Acad. gives the date 1655.	
1653. Jan. 9.	Frankfort on the Maine.	A violent trembling.			Lerner's Chronik; Kriegt.
— — 14.	Bâle				Bertrand; Wieland; Schorer, Discours von den Erdbewegungen.
— — 23.	Ditto				Wieland's Chronik.
— — Sept. 27.	Cesena and Faenza in Italy.	Shocks lasting for several days.		Did great damage to buildings	Dreadn. gel. Anz. loc. cit.
—	Smyrna	Lasted two days			
1654. Mar. 17.	Canton of Glaris, and in the canton of Glaris fifteen shocks were felt.			2000 or 3000 people killed	Ditto, Huot, loc. cit.
—	different other parts of Switzerland.			Frequent tempests this year and the following.	Bertrand; Scheuchzer; Coll. Acad.
— May 22.	Smyrna and many other places in Asia Minor.				v. Hoff.
— July 8.	Vienna	Extremely violent.			Ditto.
— — 23.	Terra di Lavoro, kingdom of Naples. In a line from the south to the north, a little east; from	The shocks continued until the 12th August.		Many villages were ruined, and numbers of people lost their lives.	vi. Huot; Bertrand; Coll. Acad.; Venzio; Terra tremens; Dredner gel. Anz. loc. cit.

1654. ....	Laybach in Carinthia .....	.....	.....	.....	Collection Académique. Terra tremens; Dread. gel. Anz. <i>loc. cit.</i>
1655. End of March .....	End of Strasburg. Also in Würtemberg.	.....	.....	.....	Lerner's Chronik; Kriegt.
— July 3 .....	Frankfort on the Maine.	.....	.....	.....	Ulloa in Hist. gén. des Voyages, t. xx. p. 31.
— Nov. 13 .....	Lima in Peru .....	.....	.....	.....	Terra tremens; Bertrand; Wieland's Chronik; Scheuchzer; Coll. Acad.
1656. Feb. 23. At night.	Bâle. Also felt at Neuchâtel and other parts of Switzerland.	Three shocks .....	.....	.....	Ditto.
— May 16. Between 3 and 4 A.M.	Bâle .....	One shock .....	.....	.....	.....
— Aug. ....	Ditto .....	Ditto .....	.....	.....	.....
— — .....	In Syria .....	.....	.....	.....	.....
— — .....	District of San Salvador in Mexico.	Disastrous .....	.....	.....	Ennery et Hirth, <i>loc. cit.</i>
1657. Jan. 29.	Naples and Calabria .....	Lasted but a short time.	.....	.....	Dread. gel. Anz. <i>loc. cit.</i> ; Huot, <i>loc. cit.</i>
— Feb. 15. 3 P.M.	St. Maure, not far from Tours (Indreet Loire), and the environs for 6 miles round.	.....	.....	.....	Ditto; Theatrum Europæum. cont. p. 1093.
— Mar. 15.	St. Jago in Chili .....	Very violent .....	.....	.....	Coll. Acad.; v. Hoff.
— April 24. 11 <sup>h</sup> 45 <sup>m</sup> A.M.	In southern Norway; especially at Christiania. Extended from Osterdal to Bohus in the direction N. to S. 40 Norwegian miles, and from the Swedish frontier to Cape Lindesås in the direction E. to W.	Violent .....	.....	.....	Geologica Norvegica of Michel Pederson Escholt; Phil. Trans. vol. ii. p. 210.
— — 25. Between 3 and 4 A.M.	Ditto .....	Less violent than the last.	.....	.....	Followed, twenty-four hours after, by a violent Ditto. whirlwind at Christiania.
— July 8.	Parish of Bickly (Beccles?) in England.	.....	.....	.....	Preceded by a noise like a clap of thunder, the sky being quite serene at the time.

1.	2.	3.	4.	5.	6.
1657. Aug. 9. Båle .....					Communication of M. Ch. Martins to M. Ferrey.
1658. Feb. 18. Malta .....	Southern part of Iceland.	Shocks which were repeated up to the 13th March.			Voyage en Islande, p. 313; v. Hoff. Terra tremens; Dread. gel. Anz. loc. cit.; Kefenstein; v. Hoff.
— April 4. Messina .....		One shock .....			Ditto; Theatrum Europæum, t. viii. p. 1017.
— .....	Island of Cephalonia ..	Violent .....		Two places (names not mentioned) in the island were completely ruined. According to Kefenstein this event took place on the same day with the earthquake at Messina.	Ditto.
— .....	New England .....	Ditto .....		More than thirty villages are mentioned as having been more or less ruined. Catanzaro was the only place injured not lying to the west of the Apennines.	Phil. Trans. vol. 1. p. 9. Theatrum Europæum, t. viii. p. 1018. Vincenzo d'Amato, Mem. Ist. di Catanzaro; Annales Mundi, t. vii. p. 538; Labbe, t. v. p. 905; Coll. Acad.
— .....	Constantinople .....	Violent .....		Buildings were thrown down .....	Nani, Hist. di Vinegia, t. ii. p. 493.
1660. Jan. 31. New England .....	New England .....	Ditto .....			Phil. Trans. vol. 1. p. 9.
— June 9. In Spain and the coast of France on the Atlantic side.	In Spain and the coast of France on the Atlantic side.	Several shocks .....		Possibly only the same with the next .....	v. Hoff.
— — 21. At both sides of the Pyrenees, through the whole of the country from Bordeaux to Narbonne on the French side, and at St. Sebastian, &c. on the Spanish island of Rhodes.	At both sides of the Pyrenees, through the whole of the country from Bordeaux to Narbonne on the French side, and at St. Sebastian, &c. on the Spanish island of Rhodes.	Violent .....		Near Elgorre a mountain sunk, leaving a lake in its place, and a hot spring became suddenly cold.	Annales Mundi, t. vii. p. 543; Mém. de Chronol. t. ii. p. 919; Labbe, t. v. p. 906; Coll. Acad.; Kircher; Falasson, p. 262; Dread. gel. Anz. loc. cit.
— Oct. ....	Island of Rhodes .....	Six shocks during the time mentioned.			Dread. gel. Anz. loc. cit. Bertrand; Coll. Acad.
Dec. 5. — Nov. 30. Between 9 and 10 A.M.	Neufchatel .....				Dread. gel. Anz. 1756. No. 11.
	Tyrnau in Hungary ..				

1661. Jan. 8 or 9. Between 10 and 11 P.M.	Throughout the Canton of Glaria.			Did some damage. Scheuchzer gives as date January 9 at 11 P.M.	Bertrand; Scheuchzer; Coll. Acad.
— 15. Bâle					Communication of M. Ch. Martins to M. Perrey
— 17. Duchy of Milan					Collection Académique.
6th hour.					Bertrand; Coll. Acad.
— 25. Neuchâtel					Collection Académique.
— 25. Island of Formosa	Slight shocks				
	The shocks lasted six weeks.			The sea was violently agitated, and the ships dashed about.	
— Feb. 24. Ravenna and twenty-four places adjacent.					Dresdn. gel. Anz. loc. cit.
— Mar. 22. Central Italy; principally in Modena, Tuscany, and the States of the Church.				Modena, Florence, Faenza, Forli, and twenty other places are mentioned as having suffered considerably by this earthquake. At Casiano and Castro two clefts opened in the earth, from which there came forth a smell of sulphur.	Terra tremens; Coll. Acad.
— 27. Near Aigle in the Valais				Followed the day after by thunder, and hail of a large size.	Bertrand; Coll. Acad.
— April 22. At Venice. Also felt in the Romagna.	The direction of the vibrations at Venice was from E. to W., or according to others, from N.E. to S.W.				Sansovino, loc. cit., p. 85 and 753; Coll. Acad.
— Dec. 3. Bâle					Communication of M. Ch. Martins to M. Perrey.
— 14. Ditto					Ditto.
— 24. Ditto					Ditto.
— 27. Ditto					Ditto.
— In Spain					v. Hoff.
— England generally					Gentleman's Magazine for 1750 p. 56.
— Island of Angle near Malta.					Dresdn. gel. Anz. loc. cit.
1662. Jan. 26. 6 P.M.	New England			The houses were shaken, and chimneys thrown down.	Phil. Trans. vol. 1. p. 9.
— Sept. ... Rome	A violent shock, followed by two others during the night and following morning.				
— Nov. 6. In Calabria				Followed by a thunder-storm	Dresdn. gel. Anz. loc. cit.
				Threw down several buildings	Fiore, loc. cit. p. 289.



1.	2.	3.	4.	5.	6.
1662	Island of Candia .....				Dresdin. <i>gel. Anz. loc. cit.</i> ; Huot, <i>loc. cit.</i>
—	Province of Oomi in Japan .....			At the river Kazira a mountain sank entirely into the ground so as to leave no trace of elevation behind.	Kämpfer, v. Dohm, B. i. S. 190 and 241; Montanus, <i>Gesandtschaft.</i>
1663. Jan. 5.	In New England .....				Phil. Trans. vol. I. p. 9.
—	In the Canton of Berne, on the side of Aigle. ....	Slight .....			Bertrand; Coll. Acad.
(Or, according to others, Feb. 5).	A district of 400 leagues in circumference in Canada. ....	Very violent. The shocks recurred until the following July. ....	Ice of five or six feet thick was broken up. ....	Tabussac, Quebec, Sillery, &c. were injured by the shocks, which were accompanied by loud noise, and various atmospheric phenomena. For copious details see Perrey's memoir on earthquakes in the United States and Canada. ....	Terra tremens; Coll. Acad.; Macgregor's Travels in America, &c. &c.
— June 10.	Canton of Berne, on the side of Aigle. ....	More shocks .....			Bertrand; Coll. Acad.
— Sept. 10.	All the Alps of the canton of Glaris. ....			Accompanied by a subterranean murmuring noise, which appeared to frighten the cattle. ....	Ditto; Scheuchzer.
— 13.	Ditto .....	Several more shocks .....			Ditto.
—	The southern side of Iceland, near Krisewik. ....			At the place mentioned there was a high mountain, at whose foot was a lake of great depth. The waters of the lake were completely swallowed up by this earthquake. ....	Collection Académique.
1664. Feb. 15.	Nice and Marseilles .....			In his memoirs on the earthquakes of the Italian peninsula and of France, Belgium, and Holland, M. Perrey gives the date 1664 for this event, but in that on the earthquakes of the basin of the Rhone he places it in 1663. ....	Statistique des Bouches-du-Rhône (communication of M. Aug. Bravais to M. Perrey).
—	Tabriz in Persia, and the country round. ....	Very violent .....		Did great damage in many places .....	Hadschi Chalfa.
—	Island of Zante .....	A rather violent shock .....			Montgomery Martin, Hist. of the British Colonies, vol. v. p. 431.
—	In the East Indies, at seven days' journey from Ducca. ....	The shocks recurred for thirty-two days. ....			Collection Académique.
1665. Jan. ....	In the island of Candia. ....			Threw down many buildings, and killed several people. ....	Girolamo Brusoni, Hist. d'Italia, p. 791; Brewer, Historica, sive Hist. Univ. t. x. p. 123.

1665. Feb. 24. In the environs of Toulon, a violent earthquake and La Malbaye in Canada.					Relation de ce qui s'est passé de plus remarquable sur les côtes des Pères de la Compagnie de Jésus en la Nouvelle France en 1664 et 1665. Par Jérôme Lallemant, p. 115, et suiv.
— March 1. The Alps of the Canton of Glaris.					Bertrand; Coll. Acad.; Scheuchzer.
— — — In the kingdom of Naples.				At Nichino Casale near Aversa, about 3 miles from Naples the earth opened, and from a cleft of 350 feet long and 100 feet wide there came forth fire and smoke.	Terra tremens.
— — — 31. Neufchâtel and the neighbourhood, principally in the mountains.					Bertrand; Coll. Acad.
— May .. Ditto					Ditto.
— Oct. 15. Canada ..				Preceded by a noise louder than that of 200 pieces of artillery.	Lallemant, Relation, &c. loc. cit.
— — — In Japan ..					Montanus, Gesandtschaft.
— — — On the banks of the Ganges.					Phil. Trans. for 1763, p. 251.
— — — 1668, New England ..					Phil. Trans. vol. 1. p. 9.
and 1669.					Phil. Trans. vol. xlvii. p. 624; Révolutions du Globe; Dresden. gel.
666. Jan. 18. Oxford, Belekington, Stanton, Coventry, Brill, &c. in England.				In Hungary rocks were cleft in pieces. The date of the month is not given for the earthquake at Coventry, but there is little doubt of its being simultaneous with that at the other places. v. Hoff gives the date 1665 for all.	Anz. loc. cit.
6 F.M.					
— Feb. ... At Kamienieck in Poland					Dresden. gel. Anz. loc. cit.
— April 14. Bologna ..					Collection Académique.
7 <sup>h</sup> 55 <sup>m</sup> P.M.					Bertrand; Coll. Acad.; Scheuchzer.
— Sept. 1. Arbon on the lake of Constance.				The waters of the lake advanced 25 or 30 feet on the shore, and then retired suddenly.	

1.	2.	3.	4.	5.	6.
1666. Sept. 22.	In Syria, at Aleppo and forty-four other places around.				v. Hoff; Huot, <i>loc. cit.</i> ; Brewer, <i>loc. cit.</i> p. 141.
Oct. 20.	Eglisau in Switzerland (Canton of Zurich).	Shocks of considerable violence.			Bertrand; Scheuchzer; Coll. Acad.
Nov.	In Assyria, at Mensal and the country around.			Five towns and forty-five villages were ruined, and four new mountains were raised.	Dresdn. gel. Anz. <i>loc. cit.</i>
	Island of Corfu				Ditto.
	Oporto in Portugal			v. Hoff mentions another earthquake at Oporto in December 1667, without, however, quoting any authority. It is probably confounded with the one here mentioned.	Ditto; Huot, <i>loc. cit.</i>
Dec. 2.	Eglisau in Switzerland (Canton of Zurich).	More shocks		Accompanied by subterranean noise.	Bertrand; Scheuchzer; Coll. Acad.
8.	Ditto	Ditto		Ditto	Ditto.
11.	Bale	One violent shock		Ditto	Ditto.
14.	Eglisau in the Canton of Zurich.	Several shocks		Accompanied by subterranean noise.	Ditto.
	In the kingdom of Naples, Basilicata, and Calabria.	Several slight shocks			Vivenzio, 1783, p. 26; 1789, p. 14.
	Java				
or 1667.	In Arendschan in Asia Minor.			Accompanied by an eruption of one of the volcanoes of the island.	Raffles's History of Java, vol. ii. p. 236.
1667. Mar. 5.	In Sicily			Possibly this account and those of the 22nd Sept. and Nov. may only relate to one event.	Hadachi Chalifa.
				Followed, two days afterwards, by an eruption of Etna.	Mém. de Chronol. t. ii. p. 920.
April 6.	Ragusa, and all Dalmatia, Albania, Venice, and the Italian coast of the Adriatic; and as far as Constantinople and Smyrna.	Extremely violent. The shocks continued for eight days. The first shock, which was the most violent, was instantaneous. Direction at Ragusa = E. to W.	At Ragusa, the sea retired four times, and submarine explosions were heard.	Ragusa was quite ruined, and 5000 persons perished. The little island of Mosso near this city was greatly injured. The earthquake was attended by a violent wind at Ragusa.	Coll. Acad.; Huot, <i>loc. cit.</i> ; Ann. de Chim. et Phys. t. xxx. p. 435; Gir. Brusoni, <i>loc. cit.</i> p. 847; Nani, <i>loc. cit.</i> p. 608; Brewer, <i>loc. cit.</i> pp. 123 and 141; Baglivi, p. 516; Andriasci; Partsch, &c.
16 <sup>th</sup> 22 <sup>nd</sup> .	Bologna	Several shocks			Collection Académique.
17.	Florence	Three shocks, apparently from E. to W.		Preceded by calm and serene weather	Ditto.
5 <sup>th</sup> 30 <sup>th</sup> A.M.					
June 27.	Ancona	Several shocks			Dresdn. gel. Anz. 1756, No. 12.

1667. June 30.	Schaffhausen, Bern, Ditto Zurich, Innsbruck, and Salzburg.	.....	.....	Ditto.
— Nov. ....	At Venice, more violent at Constantinople, and still more so at Smyrna.	.....	At Smyrna the sea as well as the land was affected.	Collection Académique.
— .....	At Schamaki .....	.....	Lasted three months.	Buildings of all kinds were ruined. Mountains disappeared, and the earth opened in many places. The roads were so much injured that the caravans were obliged to adopt new routes. 80,000 persons perished. Several masses of rock, which had been detached from their places by the earthquake, formed a little hill of 59 feet high. Accompanied by loud subterranean noises, and followed by a great vapour or cloud.
— .....	Jamaica .....	.....	Several shocks .....	Philosoph. Ergotzungen oder .... deutliche Erklärung der Erdbe- ben, Bremen, 1765; Palassou, <i>loc. cit.</i> p. 380; Jean de Struys, Voyages, Amsterdam, 1681, p. 235. Langlous, Dict. de Géog. t. i. p. 66; Mém. de Chronol. t. ii. p. 920.
1668. Apr. 20. Between 3 and 4 P.M.	Canton of Glaris .....	.....	.....	Bertrand; Scheuchzer; Coll. Acad.
— — — 26.	Bâle .....	.....	.....	Communication of M. Ch. Martina to M. Perrey. Terra tremens; v. Hoff.
— May ...	At different places in the Ottoman Empire.	.....	.....	Dresdn. gel. Anz. <i>loc. cit.</i>
— July 3 to Sept. 13.	Different parts of Asia Minor.	.....	Repeated shocks for the time mentioned.	At Angora the earth opened on two different days. At Castomne on the Black Sea houses were thrown down. Stannas, Maronoy, Sur- duel, Conia, Cesarea, and several other places were much injured. (The position of these places appears to be very difficult of determina- tion at the present day.)
— July 13.	Martinique .....	.....	.....	Terra tremens; v. Hoff.
— Aug. 17.	Neustadt in Austria ..	.....	.....	Terra tremens; Dresdn. gel. Anz. <i>loc. cit.</i>
— End of	Ragusa and Cattaro.	.....	.....	Dresdn. gel. Anz. <i>loc. cit.</i>
Oct.	Also felt in Asia Minor.	.....	.....	Hadschi Chalifa.
Nov. ....	Constantinople .....	.....	Violent .....	Lerner's Chronik; Kriegt, <i>loc. cit.</i>
Dec. 14.	Frankfort on the Maine.	.....	Slight .....	Collection Académique.
Between noon and 1 P.M.	.....	.....	.....	Hist. gén. des Voyages, t. xv. p. 456; Gazette de France, Nov. 3, 1668.
— .....	Sarrebouurg in Lorraine.	.....	One shock .....	The house belonging to the Jeunists at St. Christo- pher's was thrown down. Perhaps this event is only the same with that on the 13th July.
— .....	The Antilles .....	.....	.....	

	2.	3.	4.	5.	6.
Province of Zantung in China.					Churchill's Voyages, vol. i. p. 101.
Mar. 8. All the country round Etna.	Many shocks, continuing at intervals for some days.			Followed by one of the most memorable eruptions of Etna, which is described at length by v. Hoff.	Coll. Acad.; Raspe, de novis Insulis, p. 85. Also accounts of this particular eruption by J. Alf. Borelli and Tomaso Tedeschi. Also Ferrara, descrizione, &c. p. 101.
Belgrade	One shock				Kefenstein, <i>loc. cit.</i> p. 299.
Strasbourg	Threshocks, of which the first was the most violent.				Dresdn. gel. Anz. <i>loc. cit.</i>
Bâle					Wieland's Chronik. Collection Académique.
Laybach in Carinthia					Terra tremens; Dresdn. gel. Anz. <i>loc. cit.</i>
Martinique, Guadaloupe, and St. Christopher's in the West Indies.					Kefenstein, <i>loc. cit.</i> p. 300.
Halle in Saxony	Several shocks				Terra tremens.
On 4 miles from Pernau in Livonia.					
Canton of Neufchatel					Bertrand; Collection Académique.
Hall and Innsbruck in the Tyrol, and the adjacent country, and as far south as Venice. Towards the north, as far as Widdungen, Augsburg, Donauwörth and Nuremberg; and to the west, at the lake of Constance, and the Canton of Glaris.	These widely-extended shocks lasted for several days, and were most violent in and about Hall. Their direction there was from E. to W.			Very probably (allowing for the change of style) the same with the next. v. Hoff, however, gives them as different events. At Hall a church and several other buildings were thrown down. The earthquake began with the new moon.	Terra tremens; Bertrand; Coll. Acad.; Dresdn. gel. Anz. <i>loc. cit.</i>
In the Canton of Glaris.					Bertrand; Scheuchzer; Coll. Acad.; Dresdn. gel. Anz. l. c. Nos. 12 and 13.
Schamaki or Chamaki	Many shocks during the year, there being sometimes as many as three in one day.				Jean de Struys, Voyages, p. 235.

Time	Place	Phenomena	Remarks
Feb. 1. Ditto	At night.	wards evening it became very violent, ceased at night, and recommenced the following day with equal impetuosity.	Some buildings were thrown down, and people crushed to death.
Mar. 31. Ditto	Beginning of the night.	Did not last long	Accompanied by much thunder and lightning, and a vast number of "balls of fire," which fell from the heavens, and terrified the inhabitants greatly.
May 16. Ditto			Did scarcely less damage than the preceding
June 19. Bologna 22 <sup>h</sup> 41 <sup>m</sup> .			Ditto, p. 261. Collection Académique.
Aug. 18. Schamaki			Jean de Struys, <i>loc. cit.</i> p. 261.
Sept.	On the coasts of the English Channel and German Ocean, at St. Malo, Havre, Calais, Dunkirk, and as far as Antwerp.		Dreadn. <i>gel. Anz.</i> 1756, No. 14.
Dec. 22. Innsbruck	One shock		Ditto, No. 13.
	In the archbishopric of Cologne.		Brewer, <i>Historica, sive Hist. Univ. t. x. p. 240.</i>
	Java		This event is not mentioned by Sir Stamford Raffles.
1672. Jan. 9. 3 P.M.	Seigneurie of Hohenax in the Canton of Zurich, and the neighbourhood.	Two shocks	The second shock was accompanied by a cracking noise, and did some damage.
April 14. 4 <sup>h</sup> 48 <sup>m</sup> P.M.	Rimini; felt less violently at Fano, Pesaro, Ravenna, Ancona, and other places in Italy. Almost insensible at Bologna.		More than 1500 persons perished. Most damage was done at Rimini. v. Hoff gives the date 15th April, 4 <sup>h</sup> 38 <sup>m</sup> P.M.
			Coll. Acad.; Girolamo Brusoni, <i>loc. cit.</i> p. 944; Mercure Hollandais, 1672, p. 79; Vinc. Magnati, p. 229. Dreadn. <i>gel. Anz. loc. cit.</i> No. 13.

	2.	3.	4.	5.	6.
May 12. 1 <sup>re</sup> A.M.	Seigneurie of Hohensax in the Canton of Zurich, and the neighborhood.	Another shock, more violent than that of the 9th January.		Accompanied by subterranean noise.....	Bertrand; Scheuchzer; Coll. Acad.
June 8. hour.	Around Aquila in Italy, extending in a north and south line from Montersale to Amatrice, injuring both these places. This line is nearly the same with that of the earthquake of Pontecorvo, &c. in 1654.	Violent.			Vivenzio, 1783, p. 24; 1788, p. 14.
— ...	At Rome and Castello nuovo.			Probably simultaneous with the last.....	Dresd. gel. Anz. loc. cit. No. 14.
Aug. ...	Kingdom of Murcia in Spain.	Violent.		Ditto.	
Dec. 2. t.	Uster, Eglishan, Kybourg, and other places in the Canton of Zurich.			Accompanied by a feeble noise. The weather, which had been extremely cold, became warm and pleasant immediately afterwards.	Bertrand; Scheuchzer; Coll. Acad.
— —	Bâle.....				Wieland's Chronik; Communication of M. Ch. Martin to M. Perrey. Bertrand quotes J.J. Wagner; Coll. Acad.
— 10.	Zurich.....			Probably confounded with that of the 2nd.....	Dresd. gel. Anz. loc. cit.; Huot, Cours de Géol.
.....	Most of the Grecian Islands, especially San-torin and Stanichio.	Very violent		The island of Stanichio, 70 miles in circumference, is said to have been swallowed up with all its inhabitants.	Bertrand; Scheuchzer; Coll. Acad.
Feb. 13.	In the Canton of Glaris	Many other shocks were felt here during the year, but they were less violent.		Followed by a great fall of snow.....	
March	Duseldorf.....	One shock			Dresd. gel. Anz. loc. cit.
March	Island of Sanchio. (In the Levant, or an island of the same name near the coast of China?)	Very violent.		The whole island sank into the sea during the earthquake. Very probably this account is confounded with that of the earthquake at Stanichio the year before.	Collection Académique.
May 7.	Islands of Candia and Zante.				Dresdn. gel. Anz. loc. cit.

1673. May 9. Island of Dominica in the West Indies.				Ditto.	
— 20. Gilo and Ternate in the Moluccas.				Accompanied by an eruption of a volcano at Gamacanore in Gilo.	Hist. gén. des Voyages, t. xi. p. 25; Valentyn, t. i. pp. 2, 90, 94, 331. Collection Académique.
— Aug. ... In Khorasan				The towns Metsched, Nishapour, and a third, the name of which is not given, were destroyed.	
— In the In China, at Pekin, and also at Songtschu, a place 4 leagues distant.				Others give the date 1679	De Mailla, Hist. gén. de la Chine, t. xi. p. 88; Du Halde, t. i. p. 476. Collection Académique.
— Italy					
— In the Canaries				Violent earthquakes in this year.	
				Several earthquakes.	
1674. Begin- ning of Feb. — March.				Violent shocks	Accompanied by subterranean noise, and showers of fire and stones. (Probably an eruption in some of the islands.) Followed, on the 17th, by an eruption of the volcano Wawani in this island. Preceded by an explosive noise in the air, and followed by a vapour spreading itself abroad. A short time afterwards, two igneous meteors or globes of fire fell from the heavens.
Dec. 6. Du- ring the morn- ing service, it being Sunday.				A violent shock	Dresdn. gel. Anz. <i>loc. cit.</i> No. 15. Bertrand; Coll. Acad. Wieland's Chronik; Brombach's Diarium; Bertrand; Scheuchzer; Coll. Acad.
1676. Mar. 26. (According to others, 22.) — End of March.					Dresdn. gel. Anz. 1756, No. 15. Collection Académique.
— July 30. 10th hour.				Two slight shocks, and one violent one.	"Diario di un Anonymo contemporaneo." (Communicated by M. Pilla to M. Perrey.)
1677. Nov. 13.				Several shocks, which continued at intervals until the 17th.	v. Humboldt, Voyage, t. i. p. 177; v. Buch, Canar. Ins. p. 296, quotes Viera and a manuscript account preserved at Tenerife.



	2.	3.	4.	5.	6.
Port Royal in Jamaica Wolverhampton in En- gland.				Possibly only the same with the event at the same place the following year.	Hist. gén. des Voyages, t. ii. p. 246. Coll. Acad.; Révolutions du Globe; Plott's History of Staffordshire, p. 142. Ditto.
Jan. 5. Hanbury on the borders of Derbyshire.		Supposed direction from E. to W.			
— — — In Staffordshire, espe- cially at Wittenhall near Wolverhampton.		A single shock, which lasted but a short time, and was in the direction S. to N.			
Mar. 24. Sienna		Rather violent		Did no damage	Diario, &c. (Communication of M. Filla to M. Perrey).
Apr. 22. At Blois					
— — — In the district of Zabagh in Caramania.		Violent		The principal church sank considerably into the earth during this earthquake.	Dresdn. gel. Anz. loc. cit. No. 15. Ditto.
June 17. Santa Fé to the north of Lima in Peru.			The sea receded, and, after 24 hours (?), returned with de- structive violence.		Hist. gén. des Voyages, t. xx. p. 31; v. Humboldt, Voyage, t. i. p. 317.
July ... In the Pyrenees				A high mountain sank into the earth, and its place was occupied by a lake.	Gauthier, Bibliothèque des Philo- sophes, t. ii. p. 402; Mém. de Chronol. t. ii. p. 920. Collection Académique. Ditto.
Sept. 2. Avignon, Arles and Aix.		Three shocks		Did no damage	
Oct. 20. In England, at the same places as on the 5th January.				Preceded by a loud noise like prolonged thunder.	Ditto.
Nov. 14. Ditto, especially at Bre- wood.		The shocks recurred three times before 2 A.M. the next morning. Less violent than the last.			Ditto; Plott's History of Stafford- shire.
— 15. Ditto		Several shocks			Ditto.
Jan. 25. In the Canton of Glaris.				A subterranean rumbling noise was heard be- fore, during, and after the shocks.	Bertrand; Scheuchzer; Coll. Acad.
Mar. 4. In Mexico. (Lat. 13° 32' N.)		A remarkable earth- quake.			v. Humboldt, loc. cit. t. ii. p. 297.

1679. Mar. 14. Bâle.	One shock			Wieland's Chronik; Suppl. to Brombach's Diarium.
— June 4. The fort of Eriuan, and all the country around, to the Ararat chain.	The shocks were most violent for nine days, and continued more or less until October, or, according to others, for a whole year.		Mosques, houses, and buildings of every kind were crumbled down by this violent earthquake. It appears to have been accompanied by slight volcanic eruption in some places, as it is said that flames and smoke issued from the ground. v. Hoff gives the date 1680.	Chakathouno, Description of Edessa.
— Sept. .... At Malaga	One shock		Did no damage	Kefereisin.
— Dec. 12. In the neighbourhood of El-Tito in Calabria.	Violent			Flora, <i>loc. cit.</i> p. 289.
1680. Jan. 4. Chedney in Somersetshire, and the country for some miles round.			The air was very calm beforehand, but the shock was accompanied by a noise like a sudden gust of wind. The Gentleman's Magazine does not mention the day.	A pamphlet called The Theory and History of Earthquakes, p. 17; Gentleman's Magazine for 1750, p. 56.
— July 24. Many places in Switzerland, especially at Yverlun, Orbes, Bâle, and Neuchâtel.	Many shocks		At Orbes followed by a rumbling noise which lasted some minutes, and by storms of thunder, hail, and rain, which produced great inundations, especially in the Pays de Vaud.	Bertrand; Scheuchzer; Coll. Acad.; Wieland's Chronik.
— Aug. .... In Spain; especially destructive at Malaga.				Dresden. <i>gel. Anz. loc. cit.</i>
— Oct. 9. Throughout the whole of Spain, principally in the kingdom of Granada.	Several shocks		At Madrid the shocks were slight, but at Malaga many houses were thrown down, and clefts opened in the earth, from which torrents of water came forth. Loud subterranean noises were also heard.	Coll. Acad.; Histoire d'Espagne (anonymous), t. viii. p. 249.
— Dec. 11. Bâle.	One shock			Wieland's Chronik; Communication of M. Ch. Martins to M. Perrey.
— In Italy				Collection Académique.
— Poland				Mém. de Chronol. t. ii. p. 920; Coll. Acad.
— Island of Celebes			Accompanied by an eruption of the volcano of Kenas in this island.	Phil. Trans. vol. v. p. 19. No. 7; Valentyn, t. i. pp. 2 and 64.
1681. Jan. 10 to 12. Island of Candia	Shocks during the three days mentioned.			Dresden. <i>gel. Anz. loc. cit.</i>
— 27. Several places in Switzerland, especially in the Canton of Glaris. Also felt at Bâle and Neuchâtel.	Several shocks		In various places in the Canton of Appenzel the tiles fell from the roofs. The weather was extremely cold.	Bertrand; Scheuchzer; Coll. Acad.

1.	2.	3.	4.	5.	6.
Jan. On Mayence, Frankfort on the Maine, and Hanau. 4 and 5 p. m.?					
Aug. 19. Jassy in Moldavia M.	Lasted half a quarter of an hour. The oscillation was first from W. to E., then from E. to W., and finally from W. to E. again.			The earthquake broke the ice on the river Maine, which had been so strong that laden waggons had crossed upon it. It, however, did no damage. Preceded by a subterranean noise, which appeared to come from the West.	Dresd. gel. Anz. <i>loc. cit.</i> ; Lerner's Chronik; Kriegk.  Collection Académique.
Nov. 16. Ditto					Ditto.
— 18. Ditto					Ditto.
Dec. 27. Ditto	In the direction W. to E., which is the direction of Mont-Craplatz.			Preceded by a loud noise, apparently coming from the West.	Ditto.
Jan. 16. Trübenhausen in Hesse. May 2. Throughout the whole of seen 2 Savoy, Switzerland, 3 A.M. Provence, Alsace, Burgundy, and as far north as Paris; and even in Thuringia in Germany.	Several shocks. At Remiremont they recurred constantly for some weeks.			Accompanied by the fall of a mountain near. Accompanied by loud subterranean noise, and agitation in the air. Flames came forth from the earth in various places, particularly at Remiremont on the Moselle. In Switzerland, Bâle, Neuchâtel, Geneva, and the Canton of Glaris, were most violently affected. At Gotha the tower of the Rathhaus and the steeple of St. Margaret's church were made to oscillate very considerably. In France it was felt at Bar-le-Duc, Metz, Nancy, Troyes, Auxerre, Vesoul, Orleans, Paris, and several other places. The dates May 12 and 13 are also given, but they probably only refer to the same event.	Dresdn. gel. Anz. <i>loc. cit.</i> No. 18. Spon, Hist. de Genève, t. i. p. 555; Académie des Sciences, t. i. p. 341; Coll. Acad.; Bertrand; Richard, Hist. des Mét. t. viii. p. 495; Wieland's Chronik; Suppl. to Brombach's Diarium, &c.
— 4. Frankfort on the Maine.					Lerner's Chronik; Kriegk.
— 7. In the Canton of Glaris.				Accompanied by a loud and sudden noise like the report of a large piece of ordnance, which made the windows rattle.	Scheuchzer; Coll. Acad.
June 1. At Lyons	In the direction, according to some, of E. to W., and, according to others, of N. to S.				Collection Académique.

1682. Aug. 12	Vesuvius and the country round.			Attended by an eruption	Maria della Torre, <i>loc. cit.</i> p. 66; N. M. Messina di Molletta, <i>Relazione dell' incendio, &amp;c.</i> , Napoli. Dredn. <i>gel. Anz. loc. cit.</i>
1683. April 25	Wismar on the Baltic Sea.				
— Aug. 23	In Basilicata, kingdom of Naples.	Two great earthquakes.			Gazette de France, 16 Oct. 1683.
— Sept. 28.	Oxford and the neighbourhood. Also felt at the same hour at Burford, Watlington, Brill, and other places in Berkshire; the noise extended to Dourton in Buckinghamshire, though the shock was there inappreciable. The earthquake appears to have extended as far as Burford on the north, Long Hanborough on the north-west, Brampton on the west, Abingdon on the south, and the Thames on the east; a circuit of about 70 miles.	Another shock is mentioned, on the same day, as having been felt at 4 A.M.; but this does not seem to be at all certain. The shock lasted six seconds, and consisted of alternate vibrations, succeeding one another more and more quickly.	A man who was fishing in the Cherwell, at Oxford, perceived the boat to tremble under him, and the little fish showed signs of alarm.	Accompanied by a low noise like prolonged thunder. The weather had been very wet up to the 20th, when it became fine until the evening of the 27th, when it was very cold, and even frosty though calm and serene. The barometer was higher than it had been for three years. The <i>ignis fatuus</i> had been often seen some days before the earthquake. The most violent effects mentioned were the throwing down a tin vessel, and setting in motion a bed upon castors.	Phil. Trans. t. ii. p. 208. (edit. of 1745) t. xiv. p. 624; Coll. Acad.
— Oct. 9.	Oxford, and further north as far as Derbyshire, and the country where the coal-mines are (Staffordshire?).	Felt throughout at the same time. Very feeble at Oxford, but violent farther north.			Ditto.
— Nov. 27.	Bâle			Did great damage	Wieland's Chronik. Ziehen, p. 13.
—	Erivan, and on the frontiers of Persia and Turkey.				
—	The island of Ambuyna, and also the island Ceroewa, 40 miles off.	Violent shocks, lasting for several weeks.			Valentyn's Beschreibung v. Ostindien, B. iii. S. 17.

1.	2.	3.	4.	5.	6.
Feb. 26. 8 Apr. 25. 9 p.m.	Different parts of Switzerland, especially in the Haut-Valais, and, perhaps, at Lausanne and Bâle.	One shock		Some houses were thrown down	Bertrand; Scheuchzer; Coll. Acad.
	In Lorraine, Limousin, and Poitou.	Several shocks.			v. Hoff.
	Laybach in Carinthia			Followed by very severe cold.	Collection Académique.
	Surate (Surat?) in Further India.				Ditto.
Feb. 26. Bâle				Bertrand and the Collection Académique mention an earthquake in Switzerland as having happened on this day at between 8 and 9 p.m. It is in all probability the same with that of the year before.	Wieland's Chronik.
— 28. Ditto					Ditto.
April 25. La Cava, Salerno, S. Severino, Vietri, and other adjacent places.		A violent shock			Vivenzio, 1783, p. 27; 1788, p. 14.
Sept. 9. Canton of Glaris		One very violent shock. According to Scheuchzer, preceded by others for some days		The atmosphere was quite calm	Bertrand; Scheuchzer; Coll. Acad.
Snymna		One shock		Felt by the traveller Dumont	Collection Académique.
Jan. 1. Linköping in Sweden					Dresd. gel. Anz. loc. cit.; Keferstein.
Sept. ... Palermo and the country for 40 miles round.					Dresd. gel. Anz. loc. cit.
Laybach in Carinthia				Followed by a vast shower of ashes cast forth from a volcano on the island.	Collection Académique.
Island of Ternate					Hist. gén. des Voyages, t. ii. p. 4; Phil. Trans. No. 216, p. 42.
Mar. 5. Canton of Glaris		More very sensible shocks.			Bertrand; Scheuchzer; Coll. Acad.
— At Naples		A slight shock.			Baglivi, p. 538.
— Alexandria in Egypt		Shocks which recurred for ten to twelve days.			Dresd. gel. Anz. loc. cit.
April 23. Naples				Most of the houses and churches thrown down. The inhabitants took shelter under tents in the open country.	Lettres hist. nov. 1694, p. 488.
9 <sup>th</sup> A.M.					

1687 April 25. Midnight.	Naples, and all the coast of Amalfi; especially at Paistano.	Some other slight shocks were felt during the month.			Possibly only the same with the last	Vivenzio, 1783, p. 27; 1788, p. 14.
—	The town of Machat on the borders of Persia and India.				The town was ruined	Dread. gel. Anz. <i>loc. cit.</i>
— May 19.	In Zealand					Ditto.
— Sept. 4 A.M.	In Calabria, and an immense district along the sea coast of Peru. Also felt on board a vessel 150 hours distant from the coast.	Extremely violent			At Tropea some houses were thrown down. The town and harbour of Callao were quite destroyed by the sea. Tradition also says that wheat never flourished since on the coast visited by this earthquake.	Vivenzio, <i>loc. cit.</i> Hist. gén. des Voyages, t. xi. p. 31, quoting Ulloa; Phil. Trans. for 1694, p. 78, &c.
— Dec. 18.	Smyrna	Slight				Hist. de l'Acad. des Sciences, t. ii. p. 37; Coll. Acad.
1688. Jan. ....	Provinces of Basilicata in the kingdom of Naples.	Violent shocks for three hours.			Pisticcio was ruined, and 2000 of its inhabitants killed.	Dreadn. gel. Anz. <i>loc. cit.</i> ; Huot.
— March 1. (N.S.)	Island of Jamaica	Three shocks in 1 minute. Felt through the whole island at the same time.			The ships in the harbour at Port Royal were much injured. A ship, also, at sea to the east of the island was greatly damaged by a hurricane.	Coll. Acad.; Phil. Trans. vol. li. p. v. 572; v. Humboldt, Voyage, t. ii. p. 22.
— April 1 to 11.	Venice	Several shocks				Kefenstein.
— May 1. 10 A.M.	Genoa and a great part of the Genoese territory.	Ditto				Hist. de Gènes. (anonymous), t. iii. p. 428.
— June 5 to 8.	At Naples and many other places as far as Matese to the north, and Mirabella and Benevento to the south. Also were very great at Be- at some places in Ro- magna, at Venice, and even at Smyrna.	Many shocks. The first, which were very violent, occurred on the 5th at 21 <sup>h</sup> , and lasted a Miserere. They were very great at Be- at the same time. The shocks did not entirely cease for 2 months.			Chasms opened in the ground in many places	Giannone, <i>loc. cit.</i> p. 845; Michele del Bono, <i>loc. cit.</i> ; Coll. Acad.; Vinc. Magnati, p. 237; Vivenzio.

1.	2.	3.	4.	5.	6.
1688. July 10. 11 <sup>h</sup> 45 <sup>m</sup> A.M.	Smyrna .....	Began by a movement from W. to E., which lasted half a minute. Followed by five or six other shocks before night.	The ships near were much agitated.	A building situated on a little isthmus was thrown down, and the peninsula separated from the mainland by a channel of 100 paces wide. The town was ruined, and caught fire in many places. All the walls running E. and W. were thrown down, while those running N. and S. remained upright. The surface of the earth at the town was lowered by 2 feet. The earth opened in many places. 15,000 or 20,000 persons perished.	Coll. Acad.; Hist. de l'Acad. des Sciences, t. ii. p. 37; Kant, Géog. Fis. (Ital. Trans.) t. iv. p. 338.
— 11 and 12.	Ditto .....	More shocks .....	.....	.....	Ditto.
— Aug. 11. 8 A.M.	Ditto .....	Ditto .....	.....	The weather was very cold, and the heavens obscured. New springs were remarked.	Ditto.
— Sept. 10.	The islands of Metellino, Chio, and Salatin, and along the opposite coast of Asia Minor.	.....	.....	At Smyrna a strong smell of sulphur was perceived.	Ditto.
— At night.	Constantinople .....	.....	.....	.....	Ditto.
— 16. 4 A.M.	Genoa .....	.....	.....	.....	Ditto.
— Oct. 10.	Lima, and several other towns both of Peru and Mexico.	.....	.....	.....	Hist. de Gènes, loc. cit.
—	.....	.....	.....	.....	v. Humboldt, loc. cit. t. ii. p. 298; Dresd. gel. Anz. loc. cit.
—	.....	Shocks for seven days.	.....	.....	.....
—	.....	An earthquake .....	.....	Accompanied by loud subterranean noises, and followed by an eruption of Etna.	Ferrara, Descrizione, &c. quotes Bottone.
—	Middle near Ellemere, — England.	.....	.....	An old castle said to have been destroyed. The fact seems doubtful.	The Cook's Topography, Shropshire, p. 84.
1689. Feb. 12.	Mexico .....	.....	.....	.....	v. Humboldt, loc. cit. t. ii. p. 298.
— Mar. 14.	Etna and the neighbourhood.	A violent shock .....	.....	Followed by an eruption of the volcano .....	Ferrara, Descrizione, &c. loc. cit.
— June ...	Neufchatel and the environs.	Several shocks .....	.....	.....	Bertrand; Coll. Acad.
— Sept. 21.	In Puglia and the Terra di Bari.	Apparent direction = S. to N.	.....	Barletta, Andria, and some other places were ruined.	Vivensio, 1783, p. 29; 1788, p. 15.
— Oct. 9.	Genoa .....	.....	.....	.....	Dread. gel. Anz. loc. cit.
— Dec. 11.	Innsbruck and Augsburg.	Violent shocks .....	.....	.....	Ditto; Coll. Acad.
— 21.	Ditto .....	Ditto .....	.....	.....	Ditto.

1689 .....	Belgrade .....	Violent .....	.....	.....	.....	Hadachi Chalifa. Dread. gel. Anz. loc. cit.
1690. Jan. 13.	Smyrna .....	.....	.....	.....	.....	Ditto.
— 15.	Drontheim in Norway .....	.....	.....	.....	.....	Ditto.
— 28.	Kingston in Ireland (?) .....	.....	.....	.....	.....	v. Hoff.
— Feb. 19.	Laybach in Carinthia, .....	.....	.....	.....	.....	Dread. gel. Anz. loc. cit. No. 19.
to 21.	and in Bohemia. ....	.....	.....	.....	.....	Ditto.
— 26.	The islands of Antigua, .....	.....	.....	.....	.....	Phil. Trans. 1750.
— April 10.	Montserrat, Barbadoes, .....	.....	.....	.....	.....	Dread. gel. Anz. loc. cit.; Höpfner, das erschütterte und bebende Meissen; Lerner's Chronik; Kriegk; Coll. Acad.; Langlois, Dict. de Géogr. t. i. p. 66.
— Oct. 17.	Dublin and Kilkenny in .....	.....	.....	.....	.....	v. Hoff.
(N.S.) .....	Ireland. ....	.....	.....	.....	.....	Dread. gel. Anz. loc. cit.; Coll. Acad.
— Dec. 5.	In several places in .....	.....	.....	.....	.....	Hadachi Chalifa. Coll. Acad.; Ulloa, Voyage au Pérou, t. i. p. 467.
(N.S.) 3 P.M.	Swabia, Austria, Prus- .....	.....	.....	.....	.....	v. Hoff.
—	sia, Thuringia, and in .....	.....	.....	.....	.....	Ditto.
—	fact almost all Ger- .....	.....	.....	.....	.....	Bertrand; Coll. Acad.; Philibert's Chronik.
—	many; also in Poland .....	.....	.....	.....	.....	Lerner's Chronik; Coll. Acad.; Miscell. Acad. Nat. Curios. 1690, p. 423.
—	(the date of the year .....	.....	.....	.....	.....	
—	only, however, being .....	.....	.....	.....	.....	
—	given for this last lo- .....	.....	.....	.....	.....	
—	cality). ....	.....	.....	.....	.....	
— 18.	Cologne .....	.....	.....	.....	.....	
— Middle	In England and Scot- .....	.....	.....	.....	.....	
of the night.	land; in Bedford, .....	.....	.....	.....	.....	
—	Sutherland, &c. ....	.....	.....	.....	.....	
—	Constantinople .....	.....	.....	.....	.....	
—	Lima in Peru .....	.....	.....	.....	.....	
1691. Jan. 1.	Ancona and Rimini .....	.....	.....	.....	.....	
— 4.	Bale .....	.....	.....	.....	.....	
— 26.	Ditto .....	.....	.....	.....	.....	
6 A.M.	.....	.....	.....	.....	.....	
— Feb. 19.	Carlstadt in Transylva- .....	.....	.....	.....	.....	
— 20, and 21.	nia, Laybach in Car- .....	.....	.....	.....	.....	
—	niola, Venice, Bale, .....	.....	.....	.....	.....	
—	Metz (most violent at .....	.....	.....	.....	.....	
—	the three last places), .....	.....	.....	.....	.....	
—	Sarre-Louis, Mayence, .....	.....	.....	.....	.....	
—	Frankfort, and Hanau. .....	.....	.....	.....	.....	



1.	2.	3.	4.	5.	6.
1691. Sept. 8. 2 P.M.	Deal, Canterbury, Sandwich, and Portsmouth.	Said to last six minutes.			A pamphlet called <i>The Theory and History of Earthquakes</i> , p. 18.
— Oct. 14.	In Japan	Two shocks at Desima or Nangasaki.			Kämpfer, v. Dohm, t. ii. p. 323.
— — 17.	Aquila in Abruzzo	One shock			Kefenstein.
— — 26.	Sienna	A slight trembling			Pirro Gabrielli, <i>Mem. dei Fisicritici</i> , t. i.
— Nov. 10.	Japan	Several shocks			Kämpfer, v. Dohm, <i>loc. cit.</i>
In the evening, and at night.					
—	The town of Azua in St. Domingo.			The town was ruined	Comptes Rendus de l'Acad. t. xvi. p. 1153.
—	St. Michel in the Azores		After violent earthquakes several little islands were raised above the sea near the coast of St. Michel.		V. Buch, <i>loc. cit.</i> p. 367.
1692. June 7.	Jamaica	Extremely violent shocks, which did not entirely cease for two months.	A frigate was wrecked in the port.	The island rose in waves like the sea, and the people believed that it sank a little permanently. At Port Royal three-fourths of the houses were thrown down, and 3000 persons perished. A piece of land of about 1000 acres sank into the sea. Louis Gelday, an inhabitant of the island, was caught in one of the fissures of the earth, and thrown out again uninjured by a second shock. In this same month there was an eruption of a volcano at St. Kitt's, continuing several weeks.	Coll. Acad.; Phil. Trans. vol. ii. p. 577; Hist. gén. des Voyages, t. xv. p. 581; <i>Mercure Hist. et Polit. Sept. 1692</i> , p. 344; <i>Montg. Martin</i> , vol. ii. p. 155; <i>Preuss. Staats-Zeitung</i> , 1826, No. 36, p. 147, &c.
— Sept. 18.	Very widely extended; (N. S.) Be-the centre being probably in Brabant, and the earthquake extending to Paris, Normandy, England, Flanders, Holland, and as far east as Mayence, Frankfurt, and the Valais.	Very violent. Lasted two minutes.		Brussels, Antwerp, Spa, Ipswich, Deal, Dover, Sheerness, and other places are mentioned as having experienced these shocks. It was observed that mountains, the coasts of the sea, and the banks of rivers were most affected. There was no wind at the time of the earthquake. Many persons felt their heads giddy after the shock. The <i>Lettres Historiques</i> give the date September 25.	Bertrand; Coll. Acad.; Phil. Trans. vol. xlii. p. 624; Vivianzo; <i>L'esner's Chronik</i> ; Krieger, &c.; <i>A History of Ipswich</i> in the 19th century, by John Glyde, Jun., Ipswich, 1850, p. 13.
— or 21. Between 8 and 9 A.M.	Ditto	Less violent than the last.			Ditto.

1692. Oct. 15. Schaffhausen .....	.....	.....	.....	.....	.....	.....	Kefenstein.
— 28. Frankfort on the Maine .....	.....	.....	.....	.....	.....	.....	Ditto.
— 30. Liège .....	.....	.....	.....	.....	.....	.....	Ditto.
— 1693. Jan. 9. Lausanne, Orbes, and Yverdon. ....	.....	.....	.....	.....	.....	.....	Hist. gén. des Voyages quoting Atkins's Travels in Guinea, p. 30. Bertrand; Coll. Acad.
— 5 P.M. ....	.....	.....	.....	.....	.....	.....	Ditto; Hamilton's Observations on Mt. Veauvius, p. 59; Biblioteca Italiana, t. xi. p. 347; Phil. Trans.; Ferrara, &c. &c.
— Feb. 13. In the neighbourhood of Hecla in Iceland. ....	.....	.....	.....	.....	.....	.....	Ditto.
— April 28. Between Militello and Noto in Sicily. ....	.....	.....	.....	.....	.....	.....	Followed by a great eruption of Mount Hecla... v. Hoff.
— June 4. The island Ceroeewa in the Moluccas. ....	.....	.....	.....	.....	.....	.....	Coll. Acad. and the other authorities quoted for the 9th January.
— July 6. Venice, Padua, Mantua, and Avignon. ....	.....	.....	.....	.....	.....	.....	Phil. Trans. vol. xix. p. 49; v. Buch; loc. cit. p. 366; v. Hoff.
— End of Catania and the country round. ....	.....	.....	.....	.....	.....	.....	Authorities just quoted under 9th January.
Sept. Dec. 16 Frankfort on the Maine. (O.S.) 1 P.M. ....	.....	.....	.....	.....	.....	.....	Ditto.
— At the Havana .....	.....	.....	.....	.....	.....	.....	Lerner's Chronik; Krieger.
— Jamaica .....	.....	.....	.....	.....	.....	.....	Mercur Hist. et Polit. Mars et Avril, 1693, pp. 332 and 366.
— The country around Mount Veauvius. ....	.....	.....	.....	.....	.....	.....	v. Humboldt, loc. cit. t. v. p. 28; Phil. Trans. 1694, p. 49.
1694. March 1. The country around Mount Veauvius. ....	.....	.....	.....	.....	.....	.....	Maria della Torre, loc. cit. p. 66; Coll. Acad.; Mercure Hist. et Polit. Mai, 1694, p. 462. A description of the succeeding eruption by Ant. Balfone.

1.	2.	3.	4.	5.	6.
1891. Sept. 8. 2 P.M.	Deal, Canterbury, Sandwich, and Portsmouth.	Said to last six minutes.			A pamphlet called <i>The Theory and History of Earthquakes</i> , p. 18.
— Oct. 14.	In Japan	Two shocks at Desima or Nangasacki.			Kämpfer, v. Dohm, t. ii. p. 323.
— — 17.	Aquila in Abruzzo	One shock			Kaferstein.
— — 26.	Sienna	A slight trembling			Pirro Gabrieli, <i>Mem. dei Finiortici</i> , t. i.
— Nov. 10.	Japan	Several shocks			Kämpfer, v. Dohm, <i>loc. cit.</i>
In the evening, and at night.					
— — —	The town of Azus in St. Domingo.			The town was ruined	Comptes Rendus de l'Acad. t. xvi. p. 1153.
— — —	St. Michel in the Azores		After violent earthquakes several little islands were raised above the sea near the coast of St. Michel.		v. Buch, <i>loc. cit.</i> p. 367.
1892. June 7. Between 11 A.M. and noon.	Jamaica	Extremely violent shocks, which did not entirely cease for two months.	A frigate was wrecked in the port.	The island rose in waves like the sea, and the people believed that it sank a little permanently. At Port Royal three-fourths of the houses were thrown down, and 3000 persons perished. A piece of land of about 1000 acres sank into the sea. Louis Galday, an inhabitant of the island, was caught in one of the fissures of the earth, and thrown out again uninjured by a second shock. In this same month there was an eruption of a volcano at St. Kitt's, continuing several weeks.	Coll. Acad.; Phil. Trans. vol. li. p. 577; Hist. gén. des Voyages, t. xv. p. 591; <i>Mémoire Hist. et Polit. Sept. 1692</i> , p. 344; Montg. Martin, vol. ii. p. 155; Preuss. Staats-Zeitung, 1826, No. 36, p. 147, &c.
— Sept. 18. (N.S.) Between 2 and 3 P.M.	Very widely extended; the centre being probably in Brabant, and the earthquake extending to Paris, Normandy, England, Flanders, Holland, and as far east as Mayence, Frankfurt, and the Valais.	Very violent. Lasted two minutes.		Brussels, Antwerp, Spa, Ipswich, Deal, Dover, Sheerness, and other places are mentioned as having experienced these shocks. It was observed that mountains, the coasts of the sea, and the banks of rivers were most affected. There was no wind at the time of the earthquake. Many persons felt their heads giddy after the shock. The <i>Lettres Historiques</i> give the date September 25.	Bertrand; Coll. Acad.; Phil. Trans. vol. xvi. p. 624; Vivienzo; Lasser's Chronik; Krieger, &c.; A History of Ipswich in the 19th century, by John Glyde, Jun., Ipswich, 1850, p. 13.
— or 21. Between 8 and 9 A.M.	Ditto	Less violent than the last.			Ditto.

1692. Oct. 15. Schaffhausen .....	.....	.....	.....	.....	Keférstein.
— 28. Frankfort on the Maine.	.....	.....	.....	.....	Ditto.
— 30. Liège .....	.....	.....	.....	.....	Ditto.
— Ile de Fer in the Atlantic.	.....	.....	.....	.....	Hist. gén. des Voyages quoting At-
— off the coast of Africa.	.....	.....	.....	.....	kins's Travels in Guinea, p. 30.
1693. Jan. 9. Lausanne, Orbes, and	.....	.....	.....	.....	Bertrand; Coll. Acad.
Yverdun.	.....	.....	.....	.....	
— 5 P.M.	Sicily and Calabria. Extremely violent shocks. The first lasted two minutes. Direction in Calabria = S.W. to N.E. Followed by other shocks on the 10th and 11th.	.....	.....	.....	Ditto; Hamilton's Observations on Mt. Veuvius, p. 59; Biblioteca Italiana, t. xi. p. 347; Phil. Trans.; Ferrara, &c. &c.
— Feb. 13. In the neighbourhood of Hecla in Iceland.	Also affected the sea near the coast.	.....	.....	.....	v. Hoff.
— April 28. Between Militello and Noto in Sicily.	.....	.....	.....	.....	Coll. Acad. and the other authorities quoted for the 9th January.
— June 4. The island Ceroeewa in the Moluccas.	.....	.....	.....	.....	Phil. Trans. vol. xix. p. 49; v. Buch; loc. cit. p. 366; v. Hoff.
— July 6. Venice, Padua, Mantua, and Avignon.	Slight shocks	.....	.....	.....	Authorities just quoted under 9th January.
— End of Catania and the country round.	Many shocks	.....	.....	.....	Ditto.
Sept. Dec. 16. Frankfort on the Maine.	.....	.....	.....	.....	Lerner's Chronik; Krieger.
(O.S.) 1 P.M.	.....	.....	.....	.....	Mercur Hist. et Polit. Mars et Avril, 1693, pp. 332 and 366.
— At the Havana .....	.....	.....	.....	.....	v. Humboldt, loc. cit. t. v. p. 28; Phil. Trans. 1694, p. 99.
— Jamaica .....	Shocks lasting for some months.	.....	.....	.....	Maria della Torre, loc. cit. p. 66; Coll. Acad.; Mercur Hist. et Polit. Mai, 1694, p. 462. A description of the succeeding eruption by Ant. Balfone.
1694. March 1. The country around Mount Veuvius.	One slight shock. Followed by several others up to the 12th.	.....	.....	.....	
9 P.M.	.....	.....	.....	.....	

1.	2.	3.	4.	5.	6.
1691. Sept. 8. 2 P.M.	Deal, Canterbury, Sandwich, and Portsmouth.	Said to last six minutes.			A pamphlet called <i>The Theory and History of Earthquakes</i> , p. 18.
— Oct. 14.	In Japan	Two shocks at Desima or Nangasaki.			Kämpfer, v. Dohm, t. ii. p. 323.
— — 17.	Aquila in Abruzzo	One shock			Kefenstein.
— — 26.	Sienna	A slight trembling			Pirro Gabrieli, <i>Mem. dei Fisicisti</i> , t. i.
— Nov. 10.	Japan	Several shocks			Kämpfer, v. Dohm, <i>loc. cit.</i>
In the evening, and at night.					
—	The town of Azus in St. Domingo.				Comptes Rendus de l'Acad. t. xvi. p. 1153.
—	St. Michel in the Azores			The town was ruined	V. Buch, <i>loc. cit.</i> p. 367.
1692. June 7.	Jamaica	Extremely violent shocks, which did not entirely cease for two months.	After violent earthquakes several little islands were raised above the sea near the coast of St. Michel. A frigate was wrecked in the port.		
Between 11 A.M. and noon.				The island rose in waves like the sea, and the people believed that it sank a little permanently. At Port Royal three-fourths of the houses were thrown down, and 3000 persons perished. A piece of land of about 1000 acres sank into the sea. Louis Gelday, an inhabitant of the island, was caught in one of the fissures of the earth, and thrown out again unharmed by a second shock. In this same month there was an eruption of a volcano at St. Kitt's, continuing several weeks.	Coll. Acad.; Phil. Trans. vol. li. p. 577; Hist. gén. des Voyages, t. xv. p. 581; <i>Mémoire Hist. et Polit. Sept. 1692</i> , p. 344; <i>Montg. Martin</i> , vol. ii. p. 155; <i>Preuss. Staats-Zeitung</i> , 1826, No. 36, p. 147, &c.
— Sept. 18.	Very widely extended; (N.S.) Be-the centre being probably in Brabant, and the earthquake extending to Paris, Normandy, England, Flanders, Holland, and as far east as Mayence, Frankfurt, and the Valais.	Very violent. Lasted two minutes.		Brussels, Antwerp, Spa, Ipswich, Deal, Dover, Sheerness, and other places are mentioned as having experienced these shocks. It was observed that mountains, the coasts of the sea, and the banks of rivers were most affected. There was no wind at the time of the earthquake. Many persons felt their heads giddy after the shock. The <i>Lettres Historiques</i> give the date September 25.	Bertrand; Coll. Acad.; Phil. Trans. vol. xlv. p. 624; Vivienzo; <i>Lasser's Chronik</i> ; <i>Kriegs. &amp;c.</i> ; <i>A History of Ipswich in the 19th century</i> , by John Glyde, Jun., Ipswich, 1850, p. 13.
— or 21. Between 8 and 9 A.M.	Ditto	Less violent than the last.			Ditto.

1692. Oct. 15. Schaffhausen .....	.....	.....	.....	.....	.....	Kefenstein.
— 28. Frankfort on the Maine.	.....	.....	.....	.....	.....	Ditto.
— 30. Liège .....	.....	.....	.....	.....	.....	Ditto.
— .....	.....	.....	.....	.....	.....	Hist. gén. des Voyages quoting Atkins's Travels in Guinea, p. 30.
1693. Jan. 9. Lausanne, Orbes, and Yverdon.	.....	.....	.....	.....	.....	Bertrand; Coll. Acad.
— 5 P.M. ....	.....	.....	.....	.....	.....	Ditto; Hamilton's Observations on Mt. Veuvius, p. 59; Biblioteca Italiana, t. xi. p. 347; Phil. Trans.; Ferrara, &c. &c.
— Feb. 13. In the neighbourhood of Hecia in Iceland.	.....	.....	.....	.....	.....	v. Hoff.
— April 28. Between Militello and Noto in Sicily.	.....	.....	.....	.....	.....	Coll. Acad. and the other authorities quoted for the 9th January.
— June 4. The island Ceroewa in the Moluccas.	.....	.....	.....	.....	.....	Phil. Trans. vol. xix. p. 49; v. Buch, loc. cit. p. 366; v. Hoff.
— July 6. Venice, Padua, Mantua, and Avignon.	.....	.....	.....	.....	.....	Authorities just quoted under 9th January.
— End of Catania and the country round.	.....	.....	.....	.....	.....	Ditto.
Sept. Dec. 16. Frankfort on the Maine. (O.S.) 1 P.M.	.....	.....	.....	.....	.....	Lerner's Chronik; Krieger.
— At the Havana .....	.....	.....	.....	.....	.....	Mercure Hist. et Polit. Mars et Avril, 1693, pp. 332 and 366.
— Jamaica .....	.....	.....	.....	.....	.....	v. Humboldt, loc. cit. t. v. p. 28; Phil. Trans. 1694, p. 49.
1694. March 1. The country around Mount Veuvius.	.....	.....	.....	.....	.....	Maria della Torre, loc. cit. p. 66; Coll. Acad.; Mercure Hist. et Polit. Mai, 1694, p. 462. A description of the succeeding eruption by Ant. Balfone.
— 9 P.M. ....	.....	.....	.....	.....	.....	

1.	2.	3.	4.	5.	6.
1694. April 4. All the country about Veuvius, and at Urbino, Castello, Borgo, San-Sepolcro, Naples, and even some places in Romagna.	All the country about Veuvius, and at Urbino, Castello, Borgo, San-Sepolcro, Naples, and even some places in Romagna.	Many shocks, continuing for some days.		Some buildings were thrown down. Accompanied by a great eruption of Veuvius.	Maria della Torre, <i>loc. cit.</i> p. 66; Coll. Acad.; Mercure Hist. et Polit. Mai, 1695, p. 462. A description of the succeeding eruption by Ant. Bullioste.
— July ...	In Sicily and the island of Negropont at the same time.			In Negropont a bastion was thrown down .....	Mercure Hist. et Polit. 1694, Aug. p. 125; Lettres Hist. 1694, Sept. p. 253.
— Sept. 8. 9 <sup>h</sup> 45 <sup>m</sup> A.M.	In the kingdom of Naples; principally in the Terra di Lavoro, the two Calabrias and Basilicata; in a line from S.E. to N.W., between the coast of the Tyrrhenian Sea and the south-west spur of the Apennines.	At Naples it lasted the time of repeating a <i>Credo</i> . At Tricarico (Basilicata) and Sacracena (Calab. Cit.) the earthquake recommenced three times. During the course of this month and the following several other slight shocks were felt at Naples and Catania.		Naples, Sorrento, Castellamare, Vico, Ottajano, Nola, Sta. Maria, Aversa, and Capua were all violently shaken. At Naples the public buildings only were much injured. Etna threw out immense quantities of ashes.	Mercure Hist. et Polit. Oct. et Nov. 1694, pp. 359, 361, add. 476; Lettres Hist. Nov. 1694, p. 499; Coll. Acad.
1695. Feb. 24. At night.	In the Venetian territories; especially in the district of Asolano (diocese of Treviso).	Followed by other violent shocks after sunrise the following morning, which often recurred for several months.		It was remarked that the sun even at noon was pale and dull, as if hidden by a mist. The same was observed in 1783. The following winter was extremely cold.	Codice Meteorico di Nicodemo Martellini. Venezia, 1700.
— May 21. 2 P.M.	Island of Banda .....	Two shocks .....			Collection Académique.
— June 10. 11 P.M.	Different parts of the States of the Church; especially at Bagno-reale, Bologna, Viterbo, Montefiascone, Celleno, Orvieto, Castiglione, &c.	Preceded by some rather slight shocks. The most violent (especially two of the shocks) were at the hour mentioned.	The lake of Bolsena was raised so as to overflow its shores and produce an inundation for 3 miles round, afterwards retiring, and leaving the shore covered with fish.	It was remarked that the Clitumnus (le Vese), which had lost much of its waters during the earthquake of 441 or 446, now in great measure recovered them.	Kefenstein, <i>loc. cit.</i> ; Coll. Acad.; Mercure Hist. et Polit. 1695, Jul. p. 5; Août, p. 125; Sept. 247; Lettres Hist. 1695, Jul. p. 112; Août, p. 113.

1695. June 11. 3 A.M.	Ditto, and at Rome; and with less violence, at Frascati, Tivoli, and the neighbourhood.	Almost continuous shocks. The most violent at the times here mentioned.	.....	Did great damage in many places. In some localities the earth opened in chasms.	Ditto.
— 7 P.M.	Ditto	Ditto	.....	.....	Ditto.
— 12. 2 P.M.	Ditto	Ditto	.....	.....	Ditto.
1696	In Sicily	.....	.....	Several towns said to have been ruined. Possibly only the same with some of the earthquakes of the year or two before.	Histoire d'Espagne (anonymous).
—	Falmouth in England	.....	.....	.....	Gentleman's Magazine for 1750, p. 56.
1697. Feb. 20. At night.	Various places in Calabria. Felt very violently at Naples.	Several shocks	.....	Vesuvius was in a state of eruption. The houses at Naples were much shaken.	Mercure Hist. et Polit. 1697, Avril, p. 367.
— Mar. 24. 10 P.M.	Mexico	Shocks for two minutes. Followed, the next day, by others.	.....	Acapulco was destroyed; while Pueblo Nuevo was not even injured. The shocks on the following day were accompanied by a loud noise like the firing of cannon.	Hist. gén. des Voyages, t. x. p. 528.
—	Pro-Esek in the government of Waradin, Transylvania.	Several shocks	.....	Accompanied by thunder and lightning, but without doing any serious injury to buildings, &c.	Mercure Hist. et Polit. 1697, Avril, p. 367.
— Sept. 20. 21, and 23.	Sienna	Seventy-four feeble shocks on the first two days. Many slight shocks from this time until the 19th March of the following year. A very violent earthquake.	.....	Very little damage done.	Ditto, Nov. p. 587; "Manoscritto presso il cav. Perfetti, citato da Soldani."
—	Lima in Peru	Three shocks	.....	.....	Coll. Acad.; Vivenzio; v. Hoff.
— Oct. 2. Between 8 and 9 P.M.	Venice	.....	.....	.....	Mercure Hist. et Polit. loc. cit. p. 587.
1698. June 2 to July 12.	All the country round Vesuvius.	Numerous and violent shocks.	.....	Preceded by a great eruption of Vesuvius	Marinella Torre, loc. cit. p. 67; Ant. Bulifone, Compendio istorico, &c.
— June 19.	The Andes about Quito.	Very violent	.....	The summit of the volcano Carguairazo fell in, and from the broken part of the mountain came forth streams of mud and water, which did great damage. The towns Hambato and Llaclacunga were ruined by the earthquake.	Bouguer de la figure de la terre, p. 71; v. Humboldt, Atlas Pittoresque, p. 106.



1.	2.	3.	4.	5.	6
1698. ....	Catania .....	.....	.....	Did great damage. Etna was in eruption at the time.	Mercure Hist. et Polit. Juil. 1698, p. 20.
1699. Jan. 5.	Islands of Java and Sumatra.	Extremely violent. In Java not less than 208 shocks were counted.	.....	Accompanied by an eruption of the volcano Salak in Java. Great changes were produced in the surface of the islands, large landalips taking place, which in many places choked up the course of the rivers, &c.	Phil. Trans. 1700; Hooke's Posthumous Works, p. 487.
—	In Switzerland; on the Rhine and Maine; and at Hamburg.	Several shocks .....	.....	(Great numbers of aurora boreales were observed this year and the year before.	Kaferstein.
— July 14.	Lima in Peru .....	Very violent. Lasted, with many intervals, for three days.	.....	.....	v. Hoff.
— Oct. 27.	Lisbon .....	Very violent shocks .....	.....	.....	Balbi, Essai sur le Royaume de Portug. &c. t. i. p. 102.
—	At Catania and in Malta. Also felt at the same time in France, Germany, and England.	Very violent shocks .....	.....	Possibly only the same with that of last year ...	Mém. de Chronol. t. ii. p. 922.
1700. Feb. 6.	Sienna in Tuscany .....	Many shocks during the time mentioned.	.....	.....	Kaferstein.
1701. Mar. 13 to 27.	In the Saxon Erzgebirge, especially at Schneeberg.	Moderate .....	.....	On the 3rd there had been rain, and on the 4th and 5th a good deal of snow.	Joh. Fr. Seyfert, Allgemeine Geschichte der Erdbeben, p. 94, quotes Ziegler's Schauplatz der Zeit. 1 Fortsetz. S. 1208. "Manoscritto presso il cav. Perfetti, citato da Soldani."
— April 5.	Sienna .....	A violent trembling .....	.....	.....	Seyfert, loc. cit.
About the 4th hour of the night.	.....	.....	.....	.....	.....
Between 11 and 12 P.M.	.....	.....	.....	.....	.....
— 20 to 23.	In the Erzgebirge; especially at Johann Georgenstadt and Plauen.	Daily shocks .....	.....	.....	Ditto.
— Aug. 17.	In Saxony .....	.....	.....	.....	Collection Académique.
6 P.M.	.....	.....	.....	.....	.....

1701. Aug. 19. In the Linththal, Canton of Glaris. (O.S.) Between 6 and 7 P.M.	Three shocks	Accompanied by a loud noise in the air. From the 19th August of this year until the 30th January, 1702, the Canton of Glaris experienced thirty-seven, or according to others fifty (or even sixty) earthquakes, consisting of more or less shocks, often accompanied by subterranean murmurs, and sometimes loud noise. The list of thirty-seven noticed by Scheuchzer is here given. Probably only the same day as the last, allowing for change of style.	From Bertrand; Scheuchzer; Coll. Acad.
— 30. Ditto 9 P.M.			Ditto.
— 31. Ditto 3 A.M.			Ditto.
— Sept. 1. Ditto 11 P.M.			Ditto.
— 2. Ditto 9 A.M.			Ditto.
— 4. Ditto 8 A.M.	Probably two shocks.	The people in church heard the tongue (or lid) of the poor-box at the door strike twice as if struck with a stick.	Ditto.
— Ditto 5 P.M.	Two shocks, of which one was violent.		Ditto.
— 5. Ditto 9 P.M.	Violent.		Ditto.
— Ditto Between 11 P.M. and midnight.			Ditto.
— 6. Ditto 10 P.M.	A violent shock		Ditto.
— 7. At Bettchwanden, and throughout the Linththal, as far as Eschthal, to the beginning of the Schachenthal.	Very violent	Accompanied by different noises in the air. Bodies on the earth were much moved about.	Ditto.
— 8. In the two valleys of the Linththal (Gross- and Klein-thal).	One violent shock	Sufficiently great to rock the people in their beds.	Ditto.
— 1 A.M.			Ditto.
— 8 A.M.			Ditto.
— 10. Linththal and the country round.			Ditto.
— 13. Ditto (N.S.) 10 A.M.			Ditto.

1.	2.	3.	4.	5.	6.
1701. Sept. 18. Linththal and the country round. 4 P.M.				Accompanied by noise	Bertrand; Scheuchzer; Coll. Acad.
— 19. Ditto		A violent shock			Ditto.
(N.S.) 8 A.M.					
— (Hour not mentioned.)	Ditto (more violent in the Linththal than at Betschwenden).	The most violent which had been felt.		Those in church heard a noise like the violent grinding of stone, and the building was greatly shaken.	Ditto.
— 23. Ditto		A short shock and then a slight trembling.		Accompanied by a hissing or humming noise, the weather however being fine, and the sun shining.	Ditto.
(N.S.) A little before 4 P.M.					Ditto.
— 29. Ditto (felt in both valleys).		Slight oscillation, without shocks.			Ditto.
(N.S.) 7 P.M.		One of the feeblest of these earthquakes.		The ground had been covered with snow for five days. This earthquake, though very slight, was remarked by very many people.	Ditto.
— Oct. 23. Ditto				Felt by many people. There had been a thick mist all day, which cleared away about midnight, and gave place to a fine starlight night.	Ditto.
(N.S.) 6 A.M.		Moderate			Ditto.
— 25. Ditto (in both valleys)					Ditto.
(N.S.) 8 <sup>h</sup> 45 <sup>m</sup> P.M.					Ditto.
— Nov. 13. Ditto (on both sides of the Linth).		A feeble shock.			Ditto.
(N.S.) 7 A.M.					Ditto.
— Dec. 12. Ditto					Ditto.
(N.S.) 8 P.M.					Ditto.
— 19. Ditto		One violent shock			Ditto.
(N.S.) 3 <sup>h</sup> 15 <sup>m</sup> A.M.					Ditto.
— 28. Throughout the whole of the Linththal.					Ditto.
(N.S.) 6 A.M.					Ditto.
— 30. On both sides of the Linth.					Ditto.
At night.					Ditto.
1702. Jan. 4. In the two valleys		One of the most violent of these shocks.			Ditto.
(N.S.) 6 A.M.					Ditto.
— Feb. 24. Ditto					Ditto.
(N.S.) 9 P.M.					Ditto.
— March 8. Enna and the country round.		Several shocks.		Followed by an eruption which lasted until the 8th May.	Ditto.
About midnight.					Ditto.
— June 17. In the Linththal		A moderate shock			Ditto.
(N.S.) A little before 10 A.M.					Ditto.
					Bertrand; Scheuchzer; Coll. Acad.

1702. In sum- mer.	At Benevento				Did great damage	Coll. Acad.; Baglivi, <i>loc. cit.</i>
— Sept.	Martinique	Violent shocks		Also felt at sea off the coast.	Houses were thrown down	Labat, Voyage aux Iles, t. vii. p. 440.
— Oct. 2. (N.S.) Before dawn in the morning.	In the Linththal	One shock			On the 4th very heavy hail at daybreak	Bertrand; Scheuchzer; Coll. Acad.
— 18.	Rome and Norcia	A slight trembling			Followed by continual rain and a south wind for nearly four months.	Collection Académique.
— Dec. 9. (N.S.) Before 5 A.M.	The whole of the Canton of Glaris, particularly Mollia.	Three very violent shocks, extending further than any of the preceding ones.			The people were not only rocked, but violently shaken in their beds.	Bertrand; Scheuchzer; Coll. Acad.
1703. Jan 14. 2 o'clock at night.	From Rome to Naples and Aquila, in a line running from N. a little W., to S. a little E. along the Apennines. Also felt slightly at Verona, Venice, and Trente.	Very violent. At Rome the first shock, which occurred at the hour mentioned, was ver- tical, very violent, and lasted nearly a minute.			The towns of Norcia, Cascia, Leonessa, &c., were ruined. At Rome the shock was preceded by a sudden gust of wind. The day there had been very windy, and very heavy rain had fallen. Some arches of churches in the same city were separated and afterwards closed again. The earth opened in many places, and fire, and water with an abominable smell of sulphur came forth.	J. G. Roserus de terremotu qui Italia nuper, primis anni 1703 mensibus affixit. Stettin, 1703; Jac. Phil. Maraldi, Observations, &c. in Hist. de l'Acad. des Sciences de Paris, 1704, Hist. p. 8; Coll. Acad.; Huot; Baglivi; Lettres Historiques; Vivenzio; Kefenstein.
— 16. 21st hour.	Rome	A slight shock				Collection Académique.
— 18.	In Abruzzo; especially at Aquila. Also felt at Mantua, Milan, and all the country at the foot of the Alps.	Slight tremblings			The weather remained wet from the 14th to the 25th, when it became fine, and remained so for fifteen days.	Roserus and Maraldi, <i>loc. cit.</i>
— Feb. 2. 18th hour.	Barcelona in Spain. Rome and all the country affected on the 14th January; especially Aquila.	A slight shock. Several shocks. Direction = N. to S.		At the mouth of the Tiber the sea retired.	Aquila was completely ruined, and 5000 people perished there. The earth opened in several places, and threw out stones, water, &c. Noises like the reports of a pistol were heard.	Baglivi, p. 535. Maraldi and the other authors just quoted.
— 3. 21st hour.	Rome	A slight shock, followed by two or three each day up to the 25th, during which period also more than 160 were felt at Aquila.				Ditto.

1.	2.	3.	4.	5.	6.
1703. Feb. 10. Valley of the Linth, (N.S.) 7½ A.M.	Valley of the Linth, Canton of Glaris.	Violent shocks .....	.....	The houses were much shaken. Half an hour before, a great noise was heard in the air.	Bertrand; Scheuchzer; Coll. Acad.
— 11. Ditto (felt more violently at Bettschwanden than in the Linth-thal). N.B. Many of the shocks in this valley extended into the Grisons, for example to Dissentis.	Ditto (felt more violently at Bettschwanden than in the Linth-thal). N.B. Many of the shocks in this valley extended into the Grisons, for example to Dissentis.	Less violent than the last.	.....	Several times during the last year or two the fountains gave out more water than usual without any shocks being felt at the time.	Ditto.
— 25. About sunset.	Rome. Also felt at Eugubio (Duchy of Urbino), at Perugia and the neighbourhood, at Spoleto, and S. Marino.	One shock at the time mentioned, three hours after a very violent one lasting fifteen seconds, an hour after, another, at 5 o'clock (Italian) a short but very violent shock, at 6 two slight ones, at 9 two more, the ground being in continual agitation until daybreak.	.....	The day was very wet at Rome, and there was much wind. The weather became calm about sunset, when the first shock took place. These shocks took place at Spoleto periodically at 9 o'clock (Italian time). The horses, oxen, dogs, birds, &c. showed the greatest uneasiness.	Maraldi and the other authorities quoted above.
— Mar. 14. At Narni .....	At Narni .....	A violent shock .....	.....	.....	Ditto.
— 18. At Aquila .....	Aquila .....	Terrible shocks .....	.....	.....	Ditto.
— 27. Ditto. Also at Rome, Foligno, and Spoleto.	Ditto. Also at Rome, Foligno, and Spoleto.	Ditto .....	.....	Between this earthquake and the last 5000 persons perished at Aquila.	Ditto.
— 31. Before mid-day.	Rome and Aquila .....	Slight shocks .....	.....	.....	Ditto.
— April 1. 5½ 30" P.M.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 2. Ditto .....	Ditto .....	Ditto .....	.....	.....	Ditto.
— 8. Rome .....	Rome .....	Ditto .....	.....	The wind was from the south during the spring, which was wet and rather cold.	Ditto.
— Between 6 and 7 P.M.	.....	.....	.....	.....	Ditto.
— 15. Spoleto and many places in Umbria.	Spoleto and many places in Umbria.	A violent shock .....	.....	.....	Ditto.
— 18. 13th hour.	Rome .....	One shock .....	.....	.....	Ditto.

1703. May 6. Frankfort on the Maine, A slight earthquake. and Hanau.				Lerner's Chronik ; Kriegk, loc. cit.
— 13. Genoa and Carmagnole One shock				Coll. Acad. &c. before quoted.
17th hour. in Piedmont.				Ditto.
— 15. Aquila .....				Ditto.
— 24. Aquila and Rome .....				
9 P.M.				
— 25. Rome .....	Vertical .....		No more such were felt at Rome up to Jan. 1705.	Ditto.
5th hour.				Ditto.
June 29. In and about Spoleto ...	A violent shock .....			
23rd hour.				
— July 1. Genoa and Carmagnole Two slight shocks.	The direction of these and the nu- merous preceding shocks was gene- rally from N. to S.	The sea fell 6 feet in the harbour of Ge- noa, and remained so for nearly a quar- ter of an hour. The sulphurous water on the road from Tivoli to Rome fell 2½ feet. The water of the lake l'Inferno also fell about 3 feet. Wells too were much disturbed.	This year was very abundant in Italy, but after the earthquakes diseases of various sorts were very prevalent.	Ditto.
— and 2.				
Oct. ....	Nordia .....	A trembling.....		Seyfiart, loc. cit. p. 98.
Dec. 23. Asti in Piedmont. Also (In the night felt in France. of the 28th.)		Shocks for half an hour.		Ditto.
— — — — —	Terni, Spoleto, Narni, Nordia, &c. Also at Na- ples and Milan, though with less violence.	The shocks recom- menced.	Great damage done.....	Lettres Hist. 1704, Fév. p. 126.
— — — — —	La Guayra and Caracas Japan .....			v. Humboldt, loc. cit. t. v. p. 5. Kämpfer, v. Dohm, t. i. p. 120; Coll. Acad.
1704. Jan. 8. In England, at Hull; also (N.S.) 5½, 3 at Beverley, South Dal- ton, &c. Most violent in the neighbourhood of Lincoln. Feeble at Selby and Navenby.		A sudden shock .....	The town of Jeddo was ruined, and 200,000 persons lost their lives there. Accompanied at Hull by a noise like the sigh- ing of the wind, though the air was perfectly calm. Doors and furniture were set in motion, and chimneys thrown down. At Selby and Navenby a noise was heard like the rolling of carriages. Preceded by a violent tempest.	Phil. Trans. vol. xvi. p. 624; of 1745, vol. iv. p. 287; Coll. Acad.

1.	2.	3.	4.	5.	6.
1704. Jan. 30. Between 6 and 7 P.M. — May 20.	Frankfort on the Maine. Duchy of Spoleto	A trembling. Two vertical and violent shocks.		Without damage.	Lerner's Chronik; Frieht, loc. cit.
— Nov. 4. Between 4 and 5 A.M.	At Zurich and the country round.	Two violent shocks.		The feeble shocks had been almost continuous in the duchy up to this time. The same day an eruption of Veuvius began, which lasted until July 23, 1706. v. Hoff gives the date May 30.	Baglivi, loc. cit.; Coll. Acad.
— Nov. to the following Jan. Dec. 7. At midnight. — Dec. 24.	Island of St <sup>a</sup> Maura in the Archipelago. About Bologna and Florence. Island of Teneriffe	Many shocks Violent shocks, succeeding one another so rapidly that twenty-nine were counted in three hours. They became still more violent.		Preceded by a brilliant meteor in the air. At the same time there was a violent storm of thunder, lightning and wind at Bâle, where however no shock was felt. Did great damage	Scheuchzer; Bertrand; Coll. Acad. Collection Académique. Ditto.
— 27.	Ditto				v. Buch, Canar. Inseln. p. 242; v. Humboldt, loc. cit. p. 392; Coll. Acad. &c.
1705. Jan. 20. 9 o'clock. — Feb. 6 and 7. — May 22.	Rome Naples Mollis and Nafels (Canton of Glaris).	Slight Two slight tremblings A very sensible shock		On the 31st an eruption near Guimar in Llanos de los Infantes, on the side of the Peak. The eruption was very violent, and continued until the 26th February 1706. Between this and the 31st Naples was twice rather violently shaken, Spoleto and the neighbourhood, and Rimini several times. At several places shaken in 1703 the earth was not yet quite at rest.	Coll. Acad.; Baglivi, loc. cit. Seyfert, loc. cit. p. 98; Baglivi, p. 566. Scheuchzer.
— June 3. — Sept. 24. 10 A.M.	Ditto Eglisau, and slightly in the rest of the Canton of Zurich.	Ditto The Rhine was agitated.			Ditto. Bertrand; Scheuchzer; Coll. Acad.

1705, Nov. 13. Ditto. Also felt in the Between 3 Turgau, Togggenburg, 1 4 P.M. a part of Swabia, &c. Stencher 3 A.M.)	Several shocks.....	Accompanied in some places by loud noise. The snow had rapidly melted in the beginning of the month before a south wind, and caused disastrous inundations.	Ditto.
— 17. Zurich and Eglishau..... — 26. Coast of Peru near Arequipa.	More violent than the last.	The village of Areca in the district of Arequipa was ruined.	Ditto. Collection Académique. Seyfart, <i>loc. cit.</i> p. 99.
1706. April 4. Sicily and Calabria; especially at Aquila and Naples. Also felt at Rome. — May 5. Teneriffe..... — Sept. 29. In Sicily.....		Accompanied by an eruption in the same place as before. Trapano del Vasto, 15 miles from Palermo, was ruined, and many people were killed. Huot gives as date the 30th October, and says that 1000 persons perished.	v. Buch, <i>Canar. Inseln.</i> p. 243; v. Humboldt, <i>loc. cit.</i> t. i. p. 393. Seyfart, <i>loc. cit.</i> p. 100.
— Oct. 28. In Calabria..... — Nov. 3. In Abruzzo.....	A violent earthquake	Thirty-six towns were ruined between Lanciano and Termoli on the coast of the Adriatic, amongst others Sulmona. 15,000 people perished. On the 18th November a black stinking vapour was perceived coming out from a chasm which had opened in the earth near Sulmona. This afterwards took fire, and burned for a short time.	Ditto. Huot, <i>loc. cit.</i>
— — — Rome..... — — — Grimsnäs and Olves in Arnæs-Syssel, Iceland. — 1707. Feb. Frankfort on the Maine Night between 16 and 17. — In Spring Iceland..... — May 18, 21, and 24. Island of Santorin.....	Two shocks..... Many shocks, followed by others for some time.	Followed on the 23rd by the commencement of a submarine volcanic eruption, consequent on the raising of the island Nea-Kameny between Palaia and Micra-Kameny. This island was not entirely at rest until 1711, the volcanic action being particularly violent until May 1708.	Journal Historique, Janv. 1707, p. 18. Voyage en Islande, <i>loc. cit.</i> ; v. Hoff. Lersner's Chronik; Krieger, <i>loc. cit.</i> v. Hoff. Paris, 1707, p. 11; 1708, p. 28; Phil. Trans. vol. xvi. p. 19; vol. xxvii. p. 364; Roser, <i>Ann. des Missions</i> dans le Levant, t. i. p. 67. Insulins; Let



1.	2.	3.	4.	5.	6.
1707. July 28. to Aug. 18.	Vesuvius and the neighborhood.	Numerous shocks		The mountain was during this time in eruption.	Maria della Torre, <i>loc. cit.</i> ; Sorrentino, <i>Istoria del Vesuvio</i> .
— Sept. 18.	Island of Santorin	Slight		The new island increased considerably	Hist. de l'Acad. &c. just quoted.
— — 25.	Ditto			The doors of the houses opened of themselves.	Ditto.
1708. Feb. Night between 9 and 10.	Ditto	Slight		Accompanied by loud noise.	
— — 10.	Ditto			The principal shocks are here mentioned, but slighter ones appear to have been almost continuous for a long time.	Ditto.
— About 8 A.M.					
— March 3.	Calabria; especially at				
At the hour of vespers.	Maratea, Tortona, and Baronat.			Many houses and some churches thrown down.	Journal Historique, 1708, Mai, p. 341.
— 25.	Manosque (in the Basses Alpes).	Rather violent.			Mémoires de Trévoux, 1708, p. 2096.
— Aug. 14.	Ditto. (Also extended to Toulon, Marseilles, Sisteron, and Hyères.)	A violent shock	The waters of the Durance were elevated 2 or 3 feet.	Accompanied by a noise which was variously compared to that produced by the breaking up of ice, to the discharge of artillery, bellowing, and rolling of vehicles. The earth opened on the river Lagne, and flames came forth. Two whirlwinds did great damage at Manosque just at the same time as the earthquake.	Ditto; Seyfert.
— 8 o'clock.	Ditto	Another shock			Ditto.
— 10 o'clock.	Ditto	Ditto			Ditto.
— 15.	Ditto	Two shocks on this day, the principal at the time mentioned, the hour of the other not given.			Ditto.
A little before midnight.					
— 23.	Ditto	Another shock			Ditto.
3 A.M.					
8 <sup>h</sup> 15 <sup>m</sup> P.M.	Ditto	Ditto			Ditto.
— 26.	Ditto	Slight trembling			Ditto.
8 A.M.					
— 11 A.M.	Ditto	Ditto; more violent		Preceded by subterranean noise	Ditto.

1708. Aug. 26. Ditto	Three shocks			Ditto.
9 <sup>h</sup> 15 <sup>m</sup> P.M.	Three more shocks			Ditto.
— 27. Ditto	One shock			Ditto.
3 <sup>h</sup> 15 <sup>m</sup> A.M.	Fresh trembling			Ditto.
At night	Ditto			Ditto.
3 <sup>h</sup> 30 <sup>m</sup> A.M.	Another shock			Ditto.
Before 4 A.M.	Ditto; rather violent			Ditto.
— 30. Ditto	Fourteen or fifteen			Ditto.
A little after	slight shocks du-			Ditto.
3 <sup>h</sup> 30 <sup>m</sup> A.M.	ring this time.			Ditto.
6 <sup>h</sup> 45 <sup>m</sup> A.M.	Another slight shock			Ditto.
Sept. 1	More sensible than the			Ditto.
to 15.	last.			Ditto.
— 15. Ditto	Several shocks, con-			Ditto.
After mid-	tinuing during the			Ditto.
night.	first few nights of			Ditto.
— 20. Ditto	October.			Ditto.
3 <sup>h</sup> 30 <sup>m</sup> P.M.	More violent shocks			Ditto.
— 24. Ditto				Ditto.
to 30. Every				Ditto.
night.				Ditto.
— Oct. 6 Ditto				Ditto.
and 12; espe-				Ditto.
cially at mid-				Ditto.
night and 2				Ditto.
A.M. Jan. 8.				Ditto.
1709. Mar. 20.				Ditto.
2 <sup>h</sup> April 15				Ditto.
in Peru				Ditto.
Jan. 1,				Ditto.
20 <sup>th</sup>				Ditto.
1710. July ...				Ditto.
— Dec. 8.				Ditto.

1.	2.	3.	4.	5.	6.
1710. ....	Island of Zante .....	A violent shock .....	.....	.....	Montgom. Martin, Hist. of the British Colonies, vol. v. p. 431. Seyfert, <i>loc. cit.</i> p. 102.
1711. Jan. 7. Reggio in Calabria .....	.....	Three shocks .....	.....	.....	.....
Between 3 and 4 p.m.	.....	.....	.....	.....	.....
— 11. In Abruzzo .....	.....	.....	.....	.....	Ditto, p. 103.
— Feb. 9. Zurich and Bâle, extending as far as the Rhine. and 5 a.m.	.....	.....	The waters of the Rhine "bouillonnent."	.....	Coll. Acad. t. iii. p. 181; Acad. des Sciences de Paris, 1711, p. 4; Kéferstein; Bachofen's Chronik. Seyfert, <i>loc. cit.</i>
— May 10. Venice .....	.....	Several shocks .....	.....	.....	Ditto.
— 17. Bergen-op-Zoom .....	.....	Tremblings .....	.....	.....	Ditto.
— 18. In Sicily .....	.....	.....	.....	.....	Coll. Acad. t. iii. p. 183; Acad. des Sciences de Paris, 1712, p. 7.
— Oct. 6. Paris and the environs for 30 leagues round .....	.....	A very violent earthquake. .....	.....	.....	Seyfert, <i>loc. cit.</i>
— 25. Leipzig and the country round. About 7 p.m.	Constantinople .....	One shock .....	.....	.....	Hadachi Chalifa. Seyfert, <i>loc. cit.</i>
1712. Beginning of the year. ....	Rome .....	.....	.....	.....	.....
— Jan. 23. Leghorn .....	.....	A violent shock .....	.....	.....	.....
— Feb. 2 to May 21. Jaen in Andalusia .....	.....	Sixteen shocks during this period. ....	.....	.....	In February, March, April, October, and November of this year, Vesuvius was in eruption.
— April 10. In and around Vienna; especially at Neustadt. Midday. ....	.....	.....	.....	.....	Valentyn, lib. ii. p. 58; Hist. gén. des Voyages, t. xi. p. 20; Phil. Trans., &c. Seyfert, <i>loc. cit.</i>
— Aug. 11. Bea (Bex?) and the whole government of Aigle, and the Valais. p.m. and midnight. ....	.....	A very violent shock .....	.....	.....	.....
— Near Rosely in Shropshire. ....	.....	One shock .....	.....	.....	.....
— Constantinople .....	.....	.....	.....	.....	Collection Académique.
1714. Jan. 13. Brabant, Hainault, and Liège. Also felt at Brussels and Maestricht. 9 to 11 p.m. ....	.....	Slight shocks .....	.....	.....	Hadachi Chalifa. Coll. Acad.; Journ. Histor. 1714, Mars, p. 211.
— May 25. Constantinople .....	.....	Violent. ....	.....	.....	Hadachi Chalifa.

1714. June 21.	The neighbourhood of Veuivius.	Repeated shocks until the 30th.	.....	The mountain in a state of violent eruption.....	Maria della Torre, <i>loc. cit.</i> p. 68.
— July 27.	Patras .....	.....	.....	Several buildings either thrown down or much injured.	Pouqueville, <i>Voyage en Grèce</i> , t. v. p. 295.
— Aug. 28.	Island of Cephalonia ...	Much more terrible than the last.	.....	280 houses were thrown down. The earth opened, and springs of hot water made their appearance.	Ditto.
— Sept. 3.	In the Morea. Patras especially was much injured.	.....	.....	A portion of a church at Patras was thrown down.	Seyfiart, <i>loc. cit.</i>
Before 9 A.M.	District of Egisau, Canton of Zurich.	.....	.....	.....	Bertrand; Scheuchzer; Coll. Acad.
— Dec. 29.	Ditto .....	.....	.....	.....	Ditto.
9 P.M.	.....	.....	.....	.....	.....
1715. Jan. 29.	Algiers .....	Repeated shocks, continuing six days.	.....	v. Hoff, without quoting any authority, gives as date the 2nd February.	Seyfiart, <i>loc. cit.</i> ; Huot, <i>Cours de Géol.</i> t. i. p. 111.
— Feb. 10.	In the Frioul, Italy .....	One shock .....	.....	.....	Ditto.
— Feb. 10.	In the Valais .....	Slight .....	.....	The weather, which had been cold, became mild immediately after the shocks.	Bertrand; Coll. Acad.
— 19.	Nantes .....	A trembling .....	.....	.....	v. Hoff.
April 11.	Geneva .....	Three shocks .....	.....	.....	Bertrand; Coll. Acad.
— May 1.	District of Teschen in Silesia.	Oscillations for six and thirty hours.	.....	.....	Seyfiart, p. 105.
— June 12.	At Delitzsch in Saxony, and also the village of Klebitz.	.....	.....	During a storm of thunder and hail .....	Ditto.
— .....	Probably in the Morea .....	.....	.....	.....	.....
1716. Jan. 2.	In the Canton of Zurich .....	One shock .....	.....	Preceded the invasion of the Morea and Island of S <sup>a</sup> Maura by the Turks.	Pouqueville, <i>Voyage en Grèce</i> , t. v. p. 295.
— 29.	Bei Görs im Kloster Constantia." (In Illyria?)	Repeated shocks .....	.....	.....	Kefenstein.
Feb. 3.	.....	.....	.....	.....	Seyfiart, <i>loc. cit.</i>
Feb. 3.	Algiers .....	Violent .....	.....	Many houses thrown down .....	Journal Historique, Avril, 1716, p. 269.
2 A.M.	Ditto .....	Frequent shocks .....	.....	.....	Ditto.
— 4.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 5.	Ditto .....	.....	.....	Lima and Arequipa were greatly injured .....	v. Humboldt, <i>Voyage</i> , t. i. p. 317.
— 6.	In Peru .....	.....	.....	.....	Bertrand; Scheuchzer; Coll. Acad.
April 5.	Egisau, Canton of Zurich.	.....	.....	.....	.....
7 <sup>h</sup> 30 <sup>m</sup> P.M.	rich.	.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
1716. May and June.	Algiers. Also felt, though with less violence, at Catania and Syracuse.	Violent earthquakes		At Algiers 20,000 persons perished. Shaw, in his Travels in Barbary, gives this event without the date of the month, but it doubtless is the same. He adds that great landlips took place from the sides of the hills near El Kadarah and at other places.	Collection Académique.
— June 25.	Geneva, Nion (Sion?), and Morges.	Several shocks.			Bertrand; Coll. Acad.
— — 29.	Geneva.	Ditto			Ditto.
Between 10 and 11 P.M.					
Nov. 26. 3 P.M.	Neufchâtel and the environs.			On the 20th at 2 P.M. a noise had been heard in the Val-de-Ruz in this Canton, supposed by some to proceed from the air, by others from the earth.	Ditto.
— Dec. 1. 4 A.M.	Messina and Catania. Most violent at the latter place.			Houses were thrown down at Catania	Seyffart, <i>loc. cit.</i>
— — —	In central Asia, through the whole of the district Dzoungarie, between the lakes Balkhache and Dsaisang.	Very violent		The town Akru, to the south-west of the volcano of Pechan, was almost wholly ruined.	Falk, Beiträge zur Topographie der Russischen Reichs. (St. Petersburg, 1785), t. i. p. 380.
1717. April 22.	The Lipari Isles, especially Vulcano; and in the north of Sicily, most violent at Milazzo, Pozzodigotto, and Castrocalle.	Violent			Kefenstein.
— June 15 to 17.	Syracuse and Messina.	Several shocks		Did some mischief	Collection Académique.
— — 27 and 28.	Catania	Ditto; violent.		Preceded by loud subterranean explosions. Venus was in full eruption during this month.	Ditto.
— July 1. 4 P.M.	Smyrna	Two little shocks			Ditto.
— — 6.	Eglisau				Ditto; Bertrand; Scheuchzer.
— Aug. 5. Shortly before midnight.	Algiers.	A very considerable earthquake.		Did much damage	Collection Académique.

1717. Aug. 9. At Neufchâtel, and in the canton of same name.				The spring had been extremely cold.	Ditto; Scheuchzer; Bertrand.
— Sept. 27. In Mexico					v. Humboldt, t. ii. p. 298; Sonnenschmidt, Bergw.—Reviere von Mexico, p. 323.
— Dec. 18. Egilian					Bertrand; Scheuchzer; Coll. Acad.
8 P.M.					Ditto.
At noon.					Ditto.
— 27. Ditto					Ditto.
— 1718. Feb. 1. Fayal in the Azores					Ditto.
At noon.					Ditto.
— 25. Leipzig					Ditto.
— March. Island of St. Vincent in the West Indies. Also at Martinique.					Ditto.
— Night between 6 and 7.					Ditto.
— March. Catania					Ditto.
— About 18.					Ditto.
— May or June.					Ditto.
— June. Neustadt (8 miles from Vienna), and the neighbourhood.					Ditto.
— Night between 15 and 16.					Ditto.
— 19. Sin-gan-san or Sin-Sou, the capital of the Chinese province Xansi, and the country all round.					Ditto.
— 3 A.M.					Ditto.
July 9. Ditto					Ditto.

1.	2.	3.	4.	5.	6.
1718. July 17. Between 5 and 6 p.m.	Eglisau (and not in the Canton of Neufchâtel).				Coll. Acad.; Bertrand; Scheuchzer.
— ...	Canary Isles; principally in the île de Fer (Fer?), Forteventura, and Canarie properly so called. Also felt in the Azores.	Shocks for fifteen days		Chasms opened in the ground, and rocks were thrown from the hills.	Collection Académique.
— Dec. (or May) 1.	Near Hernösand in Sweden.	The first trembling, which was violent and lasted about a quarter of an hour, was followed by twenty others of less importance. Several shocks		Followed by the opening of fissures in the mountains.	Acad. des Sciences de Stockholm, 1748.
— Between 5 and 6 p.m.	10. Eglisau (and not in the Canton of Neufchâtel).				Bertrand; Scheuchzer; Coll. Acad.
— ...	Island of Cyprus			The capital of the island was destroyed, and many persons lost their lives in the ruins.	Mercure de France, Déc. 1718 (sous la Rubrique de Gènes. 12 Déc. p. 179).
1719. Jan. 7. About 4 p.m.	Padua, Ferrara, Bologna, Venice and some of the neighbouring islands.	Several shocks		A chimney was thrown down at Venice, and some walls were cracked.	Coll. Acad.; Journal Historique, 1719, Mars, p. 227.
— ...	Jamaica				Collection Académique.
— March 5.	Constantinople	Violent shocks			Ditto; v. Hoff.
— 6.	Ditto. Also at Villanova	Lasted four minutes in			Ditto; Journal Histor. 1719, Juin, p. 465; Phil. Trans. vol. xlix. p. 116.
(In Portugal a quarter of an hour before sunrise.)	in Algarbia, Portugal, and in many other parts of the same kingdom; and at several places in Champagne and Lorraine.	The movement was but slight in Champagne and Lorraine. At Constantinople the shocks did not cease for thirty days.			
— ...	Smyrna and Aleppo	Many shocks		At Aleppo three mosques and 200 houses were ruined.	Ditto.
— March	In Tuscany, at Piacenza, and as far as Perugia and Viterbo.	Rather violent shocks at intervals.			Ditto.

1719. May 25. Syracuse .....	Several shocks, recurring for some days.	Several houses thrown down .....	Journ. Hist. Sept. 1719, p. 185.
— 25. Constantinople, and in Natolia, forty miles from that city. Also between Scutari and the fle des Princes, and at the town of Sevenit. Also at Smyrna .....	Very violent. At Constantinople the first shock lasted three minutes, followed, and after, by another of less violence, and at intervals by others for three days.	During the first motion a black powder was seen to rise from the town and suburb of Galata, beside the sea. Four or five villages were ruined, and about 1000 people killed or maimed. Great damage was done to the buildings of Constantinople itself. Nicomedia also was ruined.	Ditto; Hadschi Chalfa; Coll. Acad.; Phil. Trans. vol. xlix. p. 116; Mercure de France, Juillet, p. 113; Août, p. 103.
— June 25. Smyrna .....	A violent earthquake .....	No damage done .....	Collection Académique.
— 29. Rome, Norcia, Chieti, Spoleto, and Foligno.	Less violent at Rome than at the other places mentioned.	.....	Ditto.
— July... Sinigaglia and Nocera in Italy.	Slight trembling .....	.....	Ditto.
— ... Along the coast of Fez and Morocco.	Very violent .....	Many villages and a part of the city of Morocco were ruined. Probably simultaneous with the last.	Ditto.
— ... Juny in the north of China.	.....	.....	Bell's Travels in Asia, in Pinkerton's Voyages and Travels, vol. vii. p. 377.
— Dec. To-wards the end of the month.	Very violent .....	Followed on the 31st. Accompanied by volcanic eruptions. The Collection Académique gives the date 1720.	xxvi. p. 69, xxvii. p. 353, xxxi. p. 100, xxxii.; Hist. de l'Acad. des Sciences, &c.
1720. Jan. 10. Genoa and Leghorn .....	Slight trembling .....	.....	Collection Académique.
— Feb. 26. Egisau, Canton of Zurich. 7 <sup>th</sup> 30 <sup>m</sup> A.M. rich.	.....	.....	Ditto; Bertrand; Scheuchzer.
— April... Peru .....	Shocks lasting for eight days.	The town of Guamanga was ruined .....	Collection Académique.
— Begin-ning of June.	In Calabria. Violent at Barletta and Ascoli, less so at Salerno, Cava, Avellino, and Sarenè. (These places are properly not in Calabria, but in Capitanata and Principato ultra, in a line passing through the Apennines from E. to W.)	.....	Ditto.



1.	2.	3.	4.	5.	6.
1720. June 11.	Pekin in China .....	.....	.....	The city much injured. Probably this event is only the same with that in 1724.	Phil. Trans. 1769, p. 71.
— 16.	In the Canton of Zurich.	.....	.....	.....	Coll. Acad.; Bertrand; Schencher.
— 22.	Constantinople .....	A slight shock.	.....	.....	Collection Académique.
— July 1.	In the Saxon Erzgebirge; especially at Freiberg and the neighbourhood. Also at Leipzig, Halle, Weimar, Meissen, and in Voigtland, in Thuringia, &c.	Violent in the Erzgebirge; at the other places mentioned, slight, but lasting some minutes.	.....	Extended in the Erzgebirge seven or eight miles in length, and felt in the mines at the depth of 169 toises. A magnet let its keeper fall, but sustained it afterwards just as well as before. Accompanied here by thunder and hail. Two days before, the barometer descended suddenly and rapidly at Freiberg.	Ditto; Journ. Hist. Sept. 1720, p. 175.
— Aug. 27.	In the kingdom of Naples.	.....	.....	Did some mischief at the monastery of Monte Cassino.	Collection Académique.
— Sept. 9.	Zurich. Also at Messina in Italy at the same time.	.....	.....	Did some damage at Messina.	Ditto.
— 12.	In Calabria; especially at Gerace on the Ionian Sea.	.....	.....	Gerace was ruined .....	Ditto.
— Oct. 18.	In the Canton of Neuchâtel.	.....	.....	During a violent tempest .....	Ditto; Bertrand.
— Nov.	Leghorn .....	A trembling .....	.....	.....	Coll. Acad.; Phil. Trans. t. li. p. 577.
Night between 19 and 20.	.....	.....	.....	.....	.....
— Dec. 20.	Several parts of Switzerland, as St. Gall, Turgau, the borders of the lake of Constance, at Constance, Stein, Appenzell, Reinegg, Altsättlen, and as far as Lindau in Bavaria. Also, though feebly, at Zurich.	Lasted about a minute	.....	Accompanied by noise, and followed by a warm wind and sulphurous vapour. In some places houses were thrown down.	Bertrand; Schencher; Coll. Acad.
— 8 A.M.	St. Gall... ..	More shocks' .....	.....	At Zurich the barometer was at 26 in. 5½ lines on the 19th, and on the 20th at 26 in. 3 lines.	Ditto.
About 1720—1730.	Neighbourhood of Heranosand.	.....	.....	Extended for 30 miles to the north and to the south.	Acad. des Sciences de Stockholm, 1748.
1721. Mar. 24.	Selva in the island of Majorca.	.....	.....	Accompanied by a subterranean noise and by inundations. Several houses were thrown down.	Journ. Hist. Juillet, 1721, p. 21.

1721. April 4. In Hungary. — 26. Tabriz in Persia.			The city was entirely ruined and more than 8000 persons lost their lives. Perrey says 9th or 26th April. Accompanied by an eruption of the volcano Katagias.	Collection Académique. Vivenzio, 1783, p. 150; Malcolm's History of Persia, vol. i. p. 614; Journ. Hist. Oct. 1721, p. 276. v. Hoff.
— May 11. Myrtdalen in Iceland			At Båle, where some walls and chimneys were thrown down, accompanied by a subterranean murmur, at Porentrui by a loud noise, and followed by a strong odour. The cold became extremely sharp for a short time immediately after the earthquake. Some days afterwards great storms, which did much mischief in Italy.	Bertrand; Scheuchzer; Coll. Acad.; Dan. Bachofen's Chronik.
— July 3. Throughout almost the whole of Switzerland; especially in the Canton of Båle, at Wattenburg, at Porentrui, and at Mühlhausen. In the Canton of Berne along the Aar; slightly in Lucerne; more violently in Zurich. Extended as far as Strasburg.			Houses injured Houses were thrown down, and bells sounded of themselves. Rather violent at Albufeira, Loulé, Silves, Faro and Tavira, where it was accompanied by loud noises and great destruction of buildings. The latter of the two journals quoted gives the date 27th January 1723, but this is probably only a mistake.	Journ. Hist. Oct. 1721, p. 276. Coll. Acad.; v. Hoff. Gazette de France, 20 Février, 1723. Ditto; Journ. Hist. Avril, 1723, p. 268.
— Aug. 3. Venice. 1722. May 24. St. Jago in Chili. — Nov. 29. Algiers. — Dec. 27. Portman and Villanova Between 5 in Portugal, and in fact all the south coast from Cape St. Vincent.			On the 23rd June Vesuvius, and in the following November Etna, were in eruption. Preceded, some seconds before, by a loud noise Accompanied by the eruption of Krabla, a mountain not before known to be a volcano. This eruption continued at intervals until 1730.	Bertrand; Scheuchzer; Coll. Acad. Gazette de France, 1723, Sept. 25 and Oct. 2. Shaw's Travels in Barbary, in Pinckerton's Voyages and Travels, vol. xv. p. 608. Coll. Acad. t. v. p. 64; Acad. des Scien. de Paris, 1725, p. 4.
1723. April 13. Egisan — About Faenza, Florenzola, and in the Mugello. Aug. — Barbary, about Algiers			Slight trembling Several shocks. Ditto	
— Jan. 13. In Bretagne			A slight trembling, not lasting more than a minute. Very violent.	
— May 17. Thyngsore-Syssel in Iceland.				

1.	2.	3.	4.	5.	6.
1724. June 11. 9 A.M.	Pekin and many places in the province of Xansi in China.	The shocks lasted about four minutes.		Houses were thrown down, and about 1000 people killed.	Du Halde, Description de la Chine, t. i. p. 481.
— — — Noon.	Ditto	More shocks			Ditto.
— — — 7 <sup>h</sup> 30 <sup>m</sup> P.M.	Ditto	Ditto			Ditto.
— — — Oct. 12.	Lisbon	Two very violent shocks, with an in- terval of some hours.		Many walls were cracked	Balbi, Essai Pol. sur le royaume de Portug. t. i. p. 102; Journ. Hist. Jan. 1725, p. 40.
— — — Dec.	Sienna	Many shocks, lasting altogether ten hours.	The Arno was disturb- ed in its course.	M. Pilla gives the date December 11, 1 P.M.	Gazette de France, 20 et 27 Janv. 1725; Journ. Hist. Mars, 1725, p. 203.
— — —	Sciacca in Sicily	Shocks during some months.			Ferrara, Campi flegrei della Sicilia.
— — —	Forty leagues to the west of Lisbon.		Though not expressly stated, of course this was felt at sea.		Collection Académique.
— — —	Constantinople	Violent.			Hadschi Chalifa.
— — —	In Barbary; principally at Algiers. Extended from Miliana to Bona.	At sea three shocks were felt.	Also felt on board an Algerine vessel, at sea, 5 leagues S. of the Seven Capes, north coast of Africa (no ground with a line of 200 fathoms). It ap- peared as if a weight of several tons had been let fall on the ballast.	The barometer very high, and the air calm and serene. No immediate change of either after the earthquake.	Shaw's Travels in Barbary, in Pin- kerton's Voyages and Travels, vol. xv. p. 606.
— — —	In Denmark				Edinburgh Encyclopedia, Article Chronology.
1725. Jan. 8.	Lima and Arequipa in Peru.				Vivenzio; v. Hoff.
— — — — — — 15.	Antigua	Violent. Lasted three minutes.			Gazette de France, 19 Mai, 1725.
— — — (O.S.?) 7 P.M.	Tchitinsack in the neigh- bourhood of Baikal.	A very violent shock. = Tunschinsk		Enormous fissures were produced both in the land and ice. Everything which was suspended in the houses was set in motion. The weather was calm.	Pallas, Voyage, t. iv. p. 396.

1725. April 17. Florence .....	Rather violent .....	.....	.....	Gazette de France, 19 Mai, 1725.
— 20. Ditto .....	Ditto .....	.....	.....	Ditto.
— June 17. Venice .....	Two slight shocks .....	.....	.....	Ditto, 13 Octobre.
About 11 A.M.	.....	.....	.....	.....
— 30. Naples .....	Violent .....	.....	.....	Ditto, 4 Août.
— July 1. Ditto .....	Ditto .....	.....	.....	Ditto.
— Aug. 3. District of Eglisau. Both banks of the Rhine were shaken.	.....	.....	For eight days Veauvius had been throwing out ashes, flames, and smoke.	Bertrand; Coll. Acad.; Scheuchzer.
— Sept. 17. Padua .....	.....	.....	Preceded by a loud noise like a clap of thunder or the discharge of a piece of ordnance, which appeared to come from the mountain of Hohen-Egg.	.....
— 17th hour.	.....	.....	At full moon .....	Toaldo, Essai Météor. p. 270.
— Oct. At Mola, Forli, Fontana Casola, &c.	Several slight shocks.	.....	.....	Journ. Hist. Fév. 1726, p. 109.
— Nov. 4. Faenza in Romagna ..	Some rather violent shocks.	.....	During inundations .....	.....
— 28. Ditto .....	Ditto .....	.....	.....	Gazette de France, 8 Déc. 1725.
..... Constantinople .....	.....	.....	Some buildings were injured .....	Ditto, 15 Déc.
1726. At the At Leghorn and Florence .....	.....	.....	.....	Hadschi Chalifa.
beginning of the year.	.....	.....	.....	Gazette de France, 25 Mai, 1726.
— Feb. 6. All the eastern side of Sicily; principally at Palermo.	Very violent .....	.....	3000 persons perished .....	Huot, Cours de Géol.
— 16. District of Eglisau .....	.....	.....	.....	.....
— April 9. Sienna and the neighbourhood.	One very violent shock, followed by two other slight ones.	.....	Did great damage to the houses both of the town and neighbourhood.	Bertrand; Scheuchzer; Coll. Acad. "Manoscritto presso il cav. Perfetti."
— About the 4th hour of the night.	.....	.....	.....	.....
— 15. Aleppo. Also felt at Alexandria at the same hour.	Three rather violent shocks from E. to W. in two minutes.	.....	Some old walls were thrown down .....	Mercure de France, 1726, Oct. p. 2349.
— 0 <sup>h</sup> 15 <sup>m</sup> P.M.	Numerous shocks .....	.....	.....	Michele del Bono, loc. cit.
— May to Sciacca in Sicily .....	.....	.....	.....	.....
— Oct. July 7. Eglisau, Hiltensberg, Glattfelden, Berne, some parts of the Pays de Vaud, Frutigen, and the neighbourhood, and throughout the Sibenthal.	The springs were troubled.	.....	.....	Bertrand; Scheuchzer; Coll. Acad.
— 1 A.M.	.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
1726. Sept. 1. Between 10 and 11 p.m.	Palermo .....	The first shocks were comparatively slight, but they increased rapidly in violence, and continued for twenty-four or twenty-five minutes.	.....	A quarter of the town was completely ruined. Four churches, ten palaces, and 1600 houses were thrown down, and from 3000 to 6000 persons perished. The earth opened in one street, and threw out burning sulphur and red-hot stones, which reduced the houses of that quarter to ashes in less than half an hour. During the earthquake the atmosphere appeared as if on fire. Half an hour before a loud noise had been heard in the air. According to v. Hoff, there was another earthquake a few days after at Noto. Ferrara gives the date for the event at Palermo, November 1.	Coll. Acad.; Gazette de France, Oct. 11 et 19; Borouaki, <i>loc. cit.</i> ; Journ. Hist. Déc. 1725, p. 420.
— Oct. 17. About 7 p.m.	Naples .....	Two shocks, followed by a third an hour afterwards.	.....	.....	Gazette de France, 30 Nov., 1726; Journ. Hist. Janv. 1727, p. 46.
— 31. Between 10 and 11 p.m.	Ditto .....	A slight shock, and an hour afterwards another rather more violent.	.....	.....	Gazette de France, 6 Déc. 1726.
— Nov. 6. About 6 a.m.	Ivelcelster (Ilchester?) in England. In the northern part of Iceland.	A rather violent shock. Several shocks .....	.....	.....	Ditto, Nov. 30.
1727. Jan. Night be- tween 5 and 6.	Palermo .....	Five consecutive shocks.	.....	Accompanied by an eruption of the volcano Krabla. Both this year and the next were marked by several volcanic eruptions in Iceland, most of which are said to have been preceded by subterranean commotions.	De Kerguelen Trémarec, Voyage dans la Mer du Nord, p. 37; Hist. gén. des Voyages, t. xviii. p. 11; Coll. Acad.
— 7. At midnight.	Ditto, and extending over all Sicily.	Two more shocks .....	.....	The town of Noto was much injured. (v. Hoff.) Ditto.	Journ. Hist. Mai, 1727, p. 349.
— 8. May 12. 6 a.m.	Palermo .....	Another shock .....	.....	Many houses damaged .....	Ditto.
	Ditto. (Several of these shocks were felt at Malta.)	Another, as violent as those of Jan. 11, 1693.	.....	Did some damage to buildings .....	Larner's Chronicle; Kriegt.
	Frankfort on the Maine.	.....	.....	.....	.....

— Oct. 4. Naples. Extended also to Swabia and England.			continuing so for some days.	Huot, <i>loc. cit.</i>
— Nov. 9. New England (N.S.). Between 10 and 11 P.M.	One very violent shock followed by five or six lighter ones, in the direction N.E. to S.W.		Accompanied by loud subterranean explosions. Preceded by an extraordinary calm; the stars sparkling brilliantly. The earth opened at Newbury, 40 leagues (or English miles?) N.E. of Boston, and threw out fine sand with ashes and pieces of sulphur.	Phil. Trans. vol. xxv. pp. 33, 63, and 124, vol. i. p. 9; Coll. Acad.
— — 7 Martinique to 27.	Shocks each day, some lasting more than three minutes (?).		Walls were cracked vertically, and one horizontally; many being thrown down. A considerable piece of land sank into the earth.	Journ. Histor. Mars, 1728, p. 229; Huot, <i>Cours de Géol. t. i. p. 112.</i>
— — 18. Newbury in New England. 11 (A.M.?)	Another shock, followed by three to six more every day and night up to the 23rd.		Preceded by a loud noise	Phil. Trans. <i>loc. cit.</i>
— — Tabriz in Persia 1728. Jan. 30. New England 2 P.M.	There were repeated slight shocks felt in this region from the 9th November 1727, to the 2nd August 1728. For details see Phil. Trans. <i>loc. cit.</i>		The city was ruined, and 77,000 people perished.	Huot, <i>loc. cit.</i> ; Hadschi Chalfia. Phil. Trans. vol. i. p. 13.
— Feb. .... Epstein, three miles from Wiesbaden.	Several shocks.			v. Hoff.
— Aug. 3. In Alsace, Switzerland, and part of Germany; especially at Berne, Zurich, Eggenau, Bâle, Strasbourg, Mannheim, and all the country between Worms, violent; Mayence, Frankfurt, Offenbach, Hanau, and Aschaffenburg. Also at Geneva.	The earthquake recurred at Bâle during the night, and at Strasbourg there were five shocks on the 3rd at 10 <sup>h</sup> 30 <sup>m</sup> A.M., 4 P.M. (the most violent), 4 <sup>h</sup> 30 <sup>m</sup> P.M., and midnight; and two on the 4th, at 15 <sup>m</sup> A.M. (very violent), & 3 <sup>h</sup> 45 <sup>m</sup> (slight).	The Rhine was much swollen.	The bell of the great clock at Berne sounded five times, and at the same place they had had the day before a violent tempest with thunder. At Strasbourg the earthquake extended 30 leagues east and west. Perrey says, without however quoting any authority, that an earthquake was felt this day at dawn at Newbury in New England; and that shocks had been experienced there every month this year except April.	Journ. Hist. Oct. 1728, p. 287; Bertrand; Coll. Acad.; France Pitior. art. Strasbourg; Bachofen's Chronik; Lerner's Chronik; Kriegk.

1.	2.	3.	4.	5.	6.
1728. Sept. ...	China				Edinburgh Encyclopedia, Article Chronology.
— Nov. 28.	Luçon in the Philippine Islands, especially at Manila.			Great devastation at Manila	Don Idefonso de Aragon, Descripción Geogr. y Topogr. de la Ysla de Luzon, Manila (1819), t. i. p. 8.
1729. Jan. 13. Between 10 and 11 P.M.	A great part of Switzer-land; especially at Berne, more violently at the hour mentioned, on the lakes of Thun and Brienz, at Inter-lachen, Spiez, Zurich, morning. At Frütigen (most vio-lently of all), Retin-gen, periodically for eight gen, Constance, Bale, nights, beginning at Lausanne, Geneva, 10 at night and ending Vevey, and generally at 7 the next morn-ing, through the Canton du Vaud.	The boats upon the lakes of Thun and Brienz were vio-lently driven on shore.		Cracks were produced in the castle of Interlachen; that of Spiez was much shaken. Lightning was observed some days before at Zurich. The night was fine but very cold, and a slight wind had been blowing from noon. From time to time this wind would become stronger, and then cease, and at the moment of its ceasing the shocks would recur. The walls of the church and castle of Rykenbach were cracked. The earth opened at a short distance from the Sibenthal. Some damage was done at Constance.	Bertrand; Coll. Acad.; Bechouën's Chronik.
— 18. 9 <sup>h</sup> 15 <sup>m</sup> P.M.	Geneva and Bale.	Another shock.			Ditto.
— Mar. 25.	Newbury in New En-gland.	Repeated slight shocks from this date until 1741.		For details of these numerous slight shocks see Phil. Trans. vol. xxxv. and l. Phil. Trans. <i>loc. cit.</i>	
— June 1. 2nd hour of the night.	Siená	A violent shock			Macchi, nelle sue Memor.
— 5th hour.	Ditto	A slight shock.			Ditto.
— 2.	Ditto	Ditto			Ditto
In the morning.	Ditto	Ditto			Ditto.
About noon.	Florence, and the coun-try for at least six or seven leagues round.	Very violent for ten minutes.		Some houses were ruined	Journ. Hist. Sept. 1729, p. 195.
Night between 22 and 23.	Velletri			Bertrand says for this year—Sundry earthquakes in Italy.	Ditto.
Some time after the last.					

1729. ....	Constantinople .....	Several earthquakes .....	.....	.....	.....	Hadschi Chalifa. Bertrand; Coll. Acad. v. Hoff.
— — — — —	Sweden .....	.....	.....	.....	The city of Meaco was destroyed. A volcanic eruption took place soon after. According to the Journal de Physique, t. xiv. p. 111, this event should be placed in the year 1730.	
— — — — —	Japan .....	.....	.....	.....	No damage done.	Journ. Hist. 1730.
1730. Mar. 28. ....	Genoa .....	One shock .....	.....	.....	Houses were thrown down at Massa-di-Carrara, and many people perished in the ruins.	Ditto.
— — — — —	In the course of the month. ....	Several shocks. ....	.....	.....	At Tivoli some walls were cracked; at Norcia the shock was so violent that almost all the houses were thrown down. More than 500 persons perished there.	Ditto.
— — — — —	May 12. ....	At Rome but one shock was felt, which lasted nearly six minutes (?).	.....	.....		
— — — — —	About 10 P.M. ....	At the other places three shocks were experienced, of which the last was the most violent at Norcia. The shocks continued almost every day up to the 28th, when there was another violent one.	.....	.....		
— — — — —	June 12. In Abruzzo. Also slightly at Messina. ....	Several slight shocks at Messina.	.....	.....	Leonessa was almost entirely destroyed .....	Ditto.
— — — — —	July 8. Concepcion in Chili ... 9 A.M. ....	Several shocks. ....	.....	Accompanied by a violent agitation of the ocean, which, at the first shocks, suddenly retired, and then on returning inundated the city and adjoining country.	The city terribly injured .....	Hist. gén. des Voyages, t. xix. pp. 415 and 419.
— — — — —	— — — — — 9. Ditto .....	More shocks, recurring at intervals for many months. Rather violent. ....	.....	.....	Completed the destruction of the city .....	Ditto.
— — — — —	In Heligland .....	.....	.....	.....		Observ. Bromann; Acta Litt. et Scientif. Sueciae, III. A. p. 105.
— — — — —	Night between 24 and Nov. 30. ....	Island of Graciosa, in the Canaries. ....	.....	.....	Followed by a volcanic eruption .....	Journ. Hist. Mai, 1731, p. 350.



1.	2.	3.	4.	5.	6.
1730. Dec. 6. At the western point of Tenerife.				The earth opened, and a little hill sank into the fissure.	Journ. Hist. Mai, 1731, p. 350.
— — — — — Kieff in Russia					Nova Acta Acad. Petropol. t. xv.; Hist. p. 71.
1731. Beginning of the year	China			Four provinces were much injured by earthquakes.	Gentleman's Magazine, vol. i. p. 309.
— Mar. 20. At Naples and in La Puglia.		Very violent. First there was a trembling, then a pulsation, and finally a rocking motion like that of a ship, lasting altogether three min. and some secs.	At Siponto and Barletta the fishermen perceived a sudden rising of the sea which nearly wrecked their boats, although there was no wind.	The heavens were obscured by heavy clouds, which afterwards cleared away before a gentle breeze from the North. Water was thrown out from wells of 30 or 40 feet deep.	Phil. Trans. (edit. 1745) t. ix. p. 398; Journ. Hist. Juin, 1731, p. 411; Seyfert, p. 111; v. Hoff.
— — — — — 21. 8 A.M.	Ditto	Shorter and less violent than the last.		The heavens were clear, but the sun appeared pale as if obscured by thin vapour. Before this earthquake the inhabitants of the Terra-di-Bari perceived around Monte Gargano a sort of flame like sudden lightning, which vanished in smoke. In the neighbourhood of Foglia this and the other earthquakes of April, October, and November, were observed to be preceded in general by violent wind from the north-east. Sometimes however it was quite calm. These aerial phenomena were accompanied by terrible noises in the open country. Foglia was greatly injured. It was supposed to be the centre of the shocks, and that they diminished in the ratio of the square of the distances of the places at which they were felt from it. About 600 persons perished. A spring of hot water made its appearance.	Ditto.
— April 17.	Foggia and its environs	Fifty shocks during the day.		3600 persons perished	Journ. Hist. 1731, Juillet, p. 46.
— June 4.	The island of Lancerote, one of the Canaries.	Violent shocks.		Accompanying a very violent and most remarkable volcanic eruption, which began on the 1st September 1730, was extremely violent for two years, and did not entirely cease until the 16th	v. Buch quotes the account of Don Andr. Lorenz. Curbato, the curé of Yaisa in the island.

1731. June 15. Between 10 and 11 p.m.	Cavallion in the department of Vauluse.	Violent.....	The dome of the Porte de la Couronne fell .....	Acad. des Sciences de Paris, 1731, Hist. p. 19; Coll. Acad. t. vii. p. 100.
— Sept. 20.	In the Abruzzo .....	Very violent. Many other slighter shocks during the month.	Several buildings thrown down. It was remarked that this earthquake and that of the 20th March were each just two days before the equinox.	Journ. Hist. 1731, Déc. p. 413.
— Oct. 17.	At Naples, and in Puglia and Abruzzo.	One very violent shock, followed by others less so.	Many buildings were thrown down at Canosa...	Ditto, 1732, Janv. p. 42.
— (N.S.) 3 A.M.	Aynho in Northamptonshire.	.....	Accompanied by a noise like distant thunder.	Phil. Trans. (edit. 1745) vol. x. p. 249; Coll. Acad.
— (N.S.) 4 A.M.	Ditto, and in the neighbourhood, at Bloxham (4 miles S.W.), Banford (5 miles off), Banbury (4 miles W.), Adderbury (1 mile W.), Croughton (1 mile E.), and Charlton (1 mile N.); but it does not appear to have extended to the south or south-east.	Another shock, lasting one minute, or, according to some, even two.	The Journal Historique places this event in the middle of November.	
— Nov. 30. Shortly before 11 A.M.	In China; in and around Pekin.	Extremely violent. After the first and greatest shock there followed in less than twenty-four hours twenty-three other slighter ones.	The first shock was so violent that buildings were instantaneously thrown down, and in less than a minute 100,000 persons in the city of Pekin alone were buried in the ruins, and still more in the surrounding country, where whole districts were ruined. The earthquake was not everywhere of equal violence in the line of its course, so that some places therein escaped comparatively well, though between others which were ruined.	Du Halde, Description de la Chine, t. i. p. 486; Bertholon in the Journal de Physique, t. xiv. p. 111.
— Dec. 9. About 5 P.M.	Florence .....	A slight shock.....	The same day a luminous cloud was seen, driven with some violence from E. to W., where it disappeared below the horizon. This phenomenon is said to have been quite different from an aurora borealis.	Journ. Hist. Fév. 1732, p. 118.

1.	2.	3.	4.	5.	6.
1731. Dec. 23.	Island of Lanzarote, one of the Canaries.	The most violent earthquake which had been felt in that island during the two preceding years of eruption.		On the 28th the eruption was renewed, having ceased for about a month. This earthquake and that of June 4, before quoted, are the only ones particularized, but it seems probable, from the account of the eruption, that slight shocks were frequently felt before or during its outbursts.	Buch, quoting Don Andr. Lorenz. Curbeto, curé of Yaiza in this island.
—	The town of St. Croix in Morocco.			The town was ruined.....	Verneur, Journal des Voyages, t. xv. p. 30.
1731 or 1732.	Felt at Bile. It is said to have extended from Portugal to the Pyrenees.			Bernoulli only says as to date, in a letter of 19th June 1737, "circiter ante quinque vel sex annos, hora sexta pomeridiana."	Jean Bernoulli, Œuvres complètes, t. iv. p. 515; Coll. Acad.
1732. Jan. 10.	Seville in Spain	A slight shock, which lasted nearly a minute. Half an hour after, a more violent one.		The second shock threw down some old walls....	Journ. Hist. Mars, 1732, p. 203.
Between 8 and 9 A.M.					
— Feb. 25.	Acapulco	Very violent	Accompanied by an extraordinary flux and reflux movement of the sea. It rose 2 or 3 metres above the level of high water, then retired, after being a moment stationary.	Destroyed a large number of the houses .....	Abel du Petit-Thouars, Voyage de la Vénus, t. ii. p. 212.
— May 21.	At Leghorn, in Tuscany, and as far as Genoa.	Six shocks		The same day a disastrous tempest at Leghorn....	Journ. Hist. Août, 1732, p. 111.
In the afternoon.					
— Aug.	Imola, Forli, and Faenza	Three shocks		Some damage done.....	Ditto, Nov. p. 341.
Night between 9 and 10.					
— Sept. 5.	Canada. Also felt slightly at Boston, in Pennsylvania, and at Annapolis in Maryland.	A violent earthquake		Some mischief was done at Montreal. At Annapolis a clock was stopped at 11 A.M.	Phil. Trans. vol. 1. p. 13.
Noon.					
— Nov. 1.	Naples	One slight shock			Vivenzio quotes "Relazione del tremuoto ..... nel di 29 Novembre

1732. Nov. 29. 13½ hour.	In the kingdom of Naples, A very violent earthquake. Another shock was felt at the two Calabrias. The centre appears to have been about Vesuvius, and from it the earthquake seems to have radiated in eight different directions, particularized by v. Hoff. At Rome also a slight shock was felt.			Buildings were thrown down at Naples. Ariano was almost entirely destroyed. Laurino also was much injured. 1940 persons are said to have been killed and 1455 wounded. On the 9th December Etna was in eruption.	Ditto; Huot, <i>loc. cit.</i> ; Coll. Acad.; Della Torre; Journ. Hist.
— Dec. 1.	Gallipoli on the west coast of the southern part of the province of Otranto.				Seyfart, p. 113.
—	Island of Corfu				
—	Strontian in Argyleshire, and all along the western coast of Scotland, though to no great breadth.				
1733. Jan. Middle of the month.	Benevento and Naples.		On the side of Fort the sea appeared to rise up.	Accompanied by a loud noise from the side where the sea seemed to rise up. Followed by disastrous rains.	Mercure de France, Mars, p. 549.
— — 29	In Puglia and Basilicata.				Gentleman's Magazine, 1750, p. 56.
— March. Night between 21 and 22. 2 p.m.	Naples. Also felt at Ariano.			About the same time Etna was in eruption	Journ. Hist. Avril, 1733, p. 265.
— May 18.	Frankfort, Offenbach, Hanau, Giessen, Butzbach, Darmstadt, and Mayence; and all the district enclosed by these places.			Accompanied at Matera by a loud noise in the air.	Ditto.
— June 14.	Annapolis in Maryland, North America.			Ariano suffered considerably	Ditto, Juin, 1733, p. 399.
— 23.	Pardines in Auvergne			Stones were thrown from the walls, and Mayence a bell was made to sound.	at Seyfart, p. 113.
				The day and month of this event do not seem fixed with certainty as the 14th June.	Collection Académique. v. Hoff.

1.	2.	3.	4.	5.	6.
1734. Nov. 5. In Sussex; especially at (N.S.) Be-Havant, Arundel, Goring, and Tarnung, Shoreham, 2 or 3 secs. and with a 4 a.m. (Al) Goodwood, &c. Also felt short interval between Chichester at Portsmouth, and Chichester. Some supposed the direction to be E. to W., at Havre and as far as the other side of the Seine. it to be N. to S. The whole of the district Violent.		At Havant two shocks were felt, each lasting 2 or 3 secs. and with a short interval between. Some supposed the direction to be E. to W., while others thought it to be N. to S. Violent.		The atmosphere was quite calm. The weather became suddenly cold just before. All moveables were much shaken. The barometer was about 30 in. Horses were observed to be much frightened, and to endeavour to make good their footing.	Phil. Trans. (edit. 1745) vol. x. p. 247; Acad. des Sciences de Paris, 1734, p. 4; Coll. Acad. t. vi. p. 617, and t. vii. p. 103
—	of Sunlendinga in Iceland.	Shocks were felt here 3 times during the year.			Voyage en Islande, <i>loc. cit.</i> ; Huot; v. Hoff.
—	Lima in Peru	Several shocks.			v. Hoff.
1735. Aug. 7. Frankfort on the Maine, Mayence, and Cologne.		Repeated shocks		Accompanied by subterranean noises, and followed by an eruption of Etna, which did not end until July 1736.	Ditto.
— Oct. 1 Etna and the country for 30 miles round.		Very considerable trembling.			Ferrara, Descrizione, &c. p. 114.
1736. Apr. 23. Fontcouverte (Maurienne).		Two shocks		Accompanied by subterranean noises	M <sup>re</sup> Alexis Billiet, Notice sur les tremblemens de terre de Maurienne, Mém. de Turin, 2 <sup>e</sup> série, t. ii. Gentlemen's Magazine, vol. vi. p. 289.
— May 1. Ochil Hills in Scotland		Rather considerable.		Some walls were cracked, and chimneys thrown down.	Coll. Acad.; Jean Bernoulli, t. iv. p. 515.
— June 12. Throughout the whole of Switzerland, & the country round. Felt at Bâle.		A single shock			Ditto.
— 6 <sup>h</sup> 12 <sup>m</sup> A.M.				Lactacunga was much injured. Flames came forth from a lake near to it.	Bouguer, De la Figure de la terre, p. 74.
— Dec. Beginning of the month.	Province of Quito; especially the town of Lactacunga.				Huot, <i>loc. cit.</i>
— (According to Keferstein, in May.)	All the northern part of Sicily; especially Ciminna, Palermo, and Naso.				
—	Island of Cyprus	Very violent		Did great damage in the northern part of the island. Probably simultaneous with the earth.	v. Hoff.
—	Island of Cephalonia				Montg. Martin, History of the British Colonies, vol. v. n. 415.

4 <sup>h</sup> 30 <sup>m</sup> P.M.	rica.	Several shocks.			Bertrand.
— 12.	The Bas Valais, and a part of the Pays de Vaud.				Gentleman's Magazine, vol. vii. p. 319.
— March 3.	Constantinople	Lasted two minutes.			Ditto.
— 5.	Smirna				Jean Bernoulli, <i>loc. cit.</i>
— May 11.	Bâle				Ditto.
— 12.	Ditto				Accompanied by a noise like distant thunder or the rolling of vehicles. The second shock was the most violent; buildings being much shaken and tables and vessels thrown down. The weather was extremely hot, but the sky was calm and clear.
3 <sup>h</sup> 45 <sup>m</sup> A.M.	11. Carlswich (Carlsruhe?) in Swabia.	A considerable shock. Another sudden shock at 2 <sup>h</sup> 30 <sup>m</sup> P.M., lasting about two minutes, and felt with still more violence at Radstadt. At Bâle a very slight one at 3 P.M. Other shocks at Carlsruhe at 10 P.M., and midnight.			Jean Bernoulli, t. iv. p. 304; Coll. Acad.
— 12.	Ditto	A violent shock at the time mentioned, and slight tremblings all day. At Bâle a very slight shock at 5 A.M.		Attended with noise	Ditto.
3 <sup>h</sup> 45 <sup>m</sup> A.M.					
— 13.	Ditto	One violent shock.		The first shock accompanied by a loud subterranean noise coming from the West. A storm about 3 P.M.	Ditto.
1 <sup>h</sup> 15 <sup>m</sup> P.M.		Another at between 3 and 4 P.M., and again at 5 P.M.			
— 14.	Ditto	A violent shock			
2 A.M.					
— 15.	Ditto	Another violent shock at 3 <sup>h</sup> 45 <sup>m</sup> A.M. followed by oscillations for three minutes. Two more at 6 <sup>h</sup> 46 and 47 <sup>m</sup> A.M. Another at 8 <sup>h</sup> 20 <sup>m</sup> A.M. followed by tremblings for eight minutes. At 10 A.M. a violent shock, followed by slight tremblings all day.		Walls were cracked. An extremely violent eruption of Vesuvius began this day, & lasted until the 23rd. Many of the shocks were attended with subterranean noise.	Ditto.
About 3 <sup>h</sup> 45 <sup>m</sup> A.M.					

1.	2.	3.	4.	5.	6.
1737. May 16. 5 to 6 <sup>h</sup> 15 <sup>m</sup> A.M.	Carlsruhe (Carlsruhe?) in Swabia.	5 or 6 violent shocks, principally at 5 <sup>h</sup> 37 and 46 <sup>m</sup> . Again at a little after 4 and at 5 P.M. numerous and violent shocks and tremblings. Many shocks and tremblings as before. Again at 8 A.M. and 8 <sup>h</sup> 5 <sup>m</sup> to 8 <sup>h</sup> 20 <sup>m</sup> .		The walls trembled much	Jean Bernoulli, t. iv. p. 304; Coll. Acad.
— 17. Ditto 5 to 6 A.M.	Ditto	Several shocks, recur- ring at 9 A.M. At 9 <sup>h</sup> 45 <sup>m</sup> P.M. a terrible earth- quake lasting 3 <sup>m</sup> or 4 <sup>m</sup> . Again at between 10 and 11 P.M. (one at 10 <sup>h</sup> 45 <sup>m</sup> was vertical) and at 11 <sup>h</sup> 45 <sup>m</sup> P.M.		The sky, which had hitherto been clear (the wind at S.W.), became obscured; the barometer went down about 4 P.M., and three thunder clouds formed in the W., S.W. and S., about 8 P.M. The sky then cleared again, and at night lightning was seen in the W., and W.S.W. These shocks did some damage. Almost all were accompanied by loud subterranean noises. The heavens were a little cloudy; thunder and rain from 8 to 9 P.M. At 9 <sup>h</sup> 45 <sup>m</sup> P.M. an igneous meteor was seen.	Ditto.
— 18. Ditto 5 to 6 A.M.	Ditto	Many shocks, but less violent than the form- er. About 3 A.M. a vio- lent trembling. Some minutes before 4 A.M., two vertical shocks. At 6 <sup>h</sup> & rather more than 40 <sup>m</sup> 2 terrible shocks, followed, 1 <sup>m</sup> after, by a third, and continuous tremblings. Between noon and 1 P.M., two more vertical shocks. At 1 P.M. a violent shock from the S.E. At 1 <sup>h</sup> 30 <sup>m</sup> another from the S. At 2 <sup>h</sup> 15 <sup>m</sup> one from S.E. at 3 <sup>h</sup> and		Most of these shocks attended as before with loud subterranean noises. The weather vari- able, and the wind shifting. At about 4 A.M., an aurora borealis, visible notwithstanding the clouds which then obscured the heavens.	Ditto.
— 19. Ditto The whole of the first hour (from mid- night of the 18th).	Ditto				

DATE	TIME	DESCRIPTION OF PHENOMENA	REMARKS
— 21. Ditto	2 A.M.	10, some minutes past 10, at 10 <sup>h</sup> 45 <sup>m</sup> A.M.; & also at 10 <sup>h</sup> 30 <sup>m</sup> P.M. Trembling	The barometer very low. Thunder, clouds, and Ditto. rain.
— 22. Ditto	1 to 3 (A.M. or P.M.?)	Four shocks. At 10 <sup>h</sup> 40 and some minutes P.M. shocks for four minutes.	The barometer still very low. The weather wet, Ditto. windy, and cold.
— 23. Ditto	At noon.	Other moderate shocks at 3 and 5 P.M.	The rain almost continuous. Winds variable ... Ditto.
— 24. Ditto	2 A.M.		Attended with a loud noise. The winds variable Ditto. and the weather tempestuous. The barometer went up again.
— 25. Ditto	About 6 <sup>h</sup> 45 <sup>m</sup> A.M.	A violent vertical shock, followed by oscillations for four minutes after, another shock. At 8 great trembling; at 9 <sup>h</sup> 15 <sup>m</sup> A.M., another shock, soon repeated. At 4 <sup>h</sup> 30 <sup>m</sup> P.M., another with oscillations; and at 6 P.M., one more shock.	Heavy rain with wind during the night. The sky Ditto. cloudy. Vortices in the air.
— 26. Ditto	1 <sup>h</sup> 30 <sup>m</sup> A.M.	One shock with trembling. At 7 A.M., another similar one. At 6 P.M., a vertical shock; at 8, another, and again, half a minute afterwards, one rather more feeble.	During the first shock a whirlwind which agitated the air until daybreak. Also an aurora borealis. At 7 A.M. the barometer had gone up a little. The mountains were covered with fog, and it rained. At 6 P.M. the barometer was much higher. Some lightning was seen. All the shocks of this day were attended with noise.
— 27. Ditto	2 P.M.	Vertical with trembling.	Rain all day and night. The mountains were covered with an extraordinary fog. They also- lutely seemed to smoke.



1.	2.	3.	4.	5.	6.
1737. May 28, 2 A.M.	Carlsuich (Carlsruhe?) in Swabia.	Tremblings for eight or ten minutes.		The weather was hotter than on the preceding days. The barometer went up in an extraordinary way. Rain at intervals. Amongst these shocks at Carlsruhe, 3 (namely, those on May 11, at 2 <sup>h</sup> 30 <sup>m</sup> P.M., May 18, at 9 <sup>h</sup> 45 <sup>m</sup> P.M., and 11 <sup>h</sup> 45 <sup>m</sup> P.M.) were extremely violent, 14 others were rather violent, and the rest were comparatively slight. Throughout the whole time there appears to have been a continuous slight trembling motion going on. During the shocks cocks and hens crowed repeatedly, and appeared much alarmed. On holding one's ear to the ground a noise like that of a vast mass of water in ebullition might be perceived. The earth was warm, and retained its heat even after the weather had become cold. The mountains were covered with thick mists, through which traces of a dim light might be perceived. Globes of fire were seen in the air on the side of Landau on the 18th; they had also been seen there three weeks before. At the same time with these shocks, slight ones were felt at Ulm, where tempests and lightning were almost continuous. A castle was thrown down. At one place the earth opened, and such a quantity of water came forth as to inundate several villages.	Jean Bernoulli, t. iv. p. 304; Coll. Acad.
— Latter end of May or beginning of June. (The authority says "depuis peu.")	Constantinople	Several violent shocks			Mercur de France, Juin, 1737, p. 1175.
— Sept. ...	Near Loputka in Kamtschatka.				
— Oct. 6.	Kamtschatka, and the Kurile Islands.	Extremely violent ...	The sea was greatly agitated, overflowed the land to an extraordinary height, and then retired so far that the bottom was visible between the first and second of the Kurile Islands.	Preceded by an eruption of Awatschinskaja or Gorilaja lasting twenty-four hours. Followed by a terrible eruption of Klutschewskaja, which lasted eight days. Great changes were produced on the surface of the country; many level places were raised into hills, and others sunk into chasms. Near the sea lakes and bays were produced.	Mém. de l'Acad. de St. Pétersbourg, 1833, ii. p. 11. Hoff; Lyell's Principles of Geology, quoting Chappe d'Auteroche, p. 337.

Dec. 7. Boston and New York in North America.	At New York three shocks were felt during the night.	At New York some chimneys were thrown down.	vol. x. p. 745. Phil. Trans. vol. I. p. 13.
1738. Jan. 9. Scarborough in Yorkshire and Taunton (in Somersetshire?).		Accompanied by the rising and falling of the ground near a mineral spring which disappeared, but reappeared soon after.	Ditto, 1741, p. 804; and 1748, p. 398.
Oct. 18. Carpentras (department of Vaucluse) in France.	Lasted two minutes.	Accompanied by a noise like 100 <i>twenty-four pounders</i> being fired at once. The acorns of some oaks fell as thickly as if there had been hail. Two minutes afterwards a rain of earth as if a mine had been sprung. The earth opened. Some chimneys were thrown down.	Hist. de l'Acad. des Sciences de Paris, 1738, Hist. p. 37.
Oct. or Nov. Boston in North America.			Phil. Trans. vol. xlix. part i. p. 443.
Nov. 8th hour. Padua.	Several shocks.		Toaldo, <i>loc. cit.</i>
Dec. 30. Halifax and other places in the West Riding of Yorkshire.		Appeared as if the earth were suddenly moved in a horizontal direction, and then returned to its former place. Accompanied by vibratory motions, and ending with a kind of hissing noise. Possibly this may only be the same as that of the 9th Jan. wrongly reported as to year, as that event happened on the 29th Dec. 1737 (O.S.). "The Theory and History of Earthquakes" gives the date 30th Dec. 1739.	Gentleman's Magazine, vol. ix. p. 45.
1739. Feb. 13. Foggia in Capitanata.	Violent.	The city of Meaco much injured	v. Hoff quotes Kracheninikow. Vivenzio, 1783, p. 34.
Also felt at Benevento.	Ditto	Did some damage at Foggia	Journ. Hist. 1739, Mai, p. 360.
Naples	Three violent shocks.		Ditto.
27. About 6 A.M. Smyrna	A slight shock.		
Mar. 24. (O.S.)	Shocks which lasted for a month, but continually decreasing in violence. The motion was horizontal from S. to N., but zigzag like flashes of lightning.	An island lying at the entrance of the harbour suddenly sank, leaving only a sandbank.	Phil. Trans. 1750, p. 700; Chandler's Travels in Asia Minor, p. 76; Hobhouse's Journey through Albania, p. 614.

1.	2.	3.	4.	5.	6.
1739. April 24. — May 4.	Different parts of Puglia and Valdemone in Sicily ..	One shock .. The shocks recurred for some days (fifteen according to Michele del Bono). There were altogether 60 or even 100 of them.		The town of Naso was almost entirely ruined. The earth opened and closed again. An eruption of Vulcano in the Lipari islands at the same time. It was remarked that each shock was followed by the noise proceeding from the volcano.	Journ. Hist. 1739, Juillet, p. 39. Ferrara, Campi flegrei; Breislak, Institut Géol. (German translation) t. iii. p. 516; Dolomieu, Voyage aux îles Lipari, p. 27.
— 21.	Ditto ..	More shocks ..		Ditto.	Ditto.
— June 9.	Ditto ..	Ditto ..		Ditto.	Ditto.
— 22.	Ditto ..	Ditto ..		Ditto.	Ditto.
or 29.					
— July 23.	Batavia in Java ..	A trembling ..			H. Vogel, Beschreibung seiner Seereisen (Leipzig, 1797), B. ii. S. 137.
— ..	Pekin in China ..	..			Vivencio, 1783, p. 34; v. Hoff.
1740. Jan. 24. — 30.	Janina in Epirus ..	Ten violent shocks ..			Pouqueville, Voyage en Grèce, t. v. p. 306.
Between 7 p.m. to 9 the next morning.	Annouay (Vivara) in France, one of the extinct volcanic localities.	A trembling, lasting three or four seconds.			Acad. des Sciences de Paris, 1740, p. 2; Coll. Acad. t. viii. p. 64.
A.M. and noon.	Ditto ..	Less violent than the last.			Ditto.
— Feb. 15.	Ditto ..	More violent than the last, less so than the first. All these shocks began towards the south.			
2 A.M.	Ditto ..	A violent shock ..			
3 <sup>h</sup> 30 <sup>m</sup> A.M.				Preceded and followed by a noise like that of thunder. This noise lasted half a minute, and went from octave to octave (!).	
— March 6.	Milan, Leghorn, Pisa, Luca, Massa-Carrara, and as far as Genoa.				Journ. Hist. Mai, 1740, p. 379.
In the morning.	Barga (Tuscany). Also at Fornacetta and Bugliano.	A terrible shock which lasted the space of one <i>Ave Maria</i> . The days following, other shocks, but slight and short.		Great damage was done to buildings at Fornacetta and Bugliano, where three persons perished in the ruins. Probably simultaneous with the last.	— "Notizia inedita," M. Pilla.
12 <sup>h</sup> hour.					
— 22.	Sciaccia in Sicily ..	Several shocks, recurring up to February			Journ. Hist. Oct. 1740, p. 137.

1740. May 22. Palermo.....	One shock .....	.....	.....	Ditto.
— June. Viterbo and Montefalco .....	Many shocks .....	.....	.....	Ditto.
— — — — — Sciacea in Sicily .....	More than 100 shocks (v. Hoffmayer, twenty- two) in some days. The most violent on the 25th, which was also felt at Palermo.	.....	It was remarked that, contrary to the general belief in Sicily, these shocks did not recur after twenty-four or forty hours.	Michele del Bono, <i>loc. cit.</i> ; Ferrara, Campi flegrei.
— Dec. ——— About the beginning of the month.	At Naples .....	.....	.....	Journ. Hist. Mars, 1741, p. 200.
1741. Jan. 29. In the Val-Demone and Val-di-Noto.	Violent trembling .....	.....	.....	Michele del Bono, <i>loc. cit.</i>
— Feb. ——— Night between 7 and 8.	Genoa .....	.....	.....	Journ. Hist. Avril, 1741, p. 278.
— April 23. ——— 11 <sup>h</sup> 30 <sup>m</sup> (Ital.)	Padua .....	.....	.....	Toaldo, <i>loc. cit.</i>
— Oct. 1. ——— 7 A.M.	Sienna .....	.....	.....	Attended with noise. Some damage done to buildings; arches, &c. being thrown down.
— Dec. 6. Boston, Roxbury, Ded- ham, and Walpole in New England.	A slight shock .....	.....	.....	Silliman's Journal, vol. xL p. 204.
1742. Jan. 10. Leghorn .....	One slight shock .....	.....	.....	Phil. Trans. 1742; Journ. Hist. 1742, Avril, p. 273; Seyfert, p. 114; Coll. Acad.; communication of M. Pilla to M. Perrey.
— — — — — 16. ——— A little after 24th hour, Italian time (?)	Ditto. Also felt at Pisa. A quarter of an hour after, one from W. to E. About 4 o'clock more shocks in the same direc- tion. At 10 <sup>h</sup> 30 <sup>m</sup> , two others. Slight undulations, scarcely perceptible.	.....	The weather was very warm in the morning, but became cold in the evening. Extraordinary clouds were remarked. The following day, fine rain ending in snow.	Ditto.
— — — — — 18. ——— Leghorn .....	.....	.....	.....	Ditto.

1.	2.	3.	4.	5.	6.
1742. Jan. 19. 12 <sup>h</sup> 30 <sup>m</sup> noon.	Leghorn. Also at Pisa...	Several shocks, all from W. to E.	The shocks at noon were felt by the captain of a Dutch vessel between Capri and Corsica. Mele. Extraordinary motions were observed off the coast.	Vapours of an extraordinary character were seen at dawn, and remained until two hours before the shocks. The heat then became excessive, and the shocks began with a loud noise. The water in some wells was increased before the shocks.	Phil. Trans. 1742; Journ. Hist. 1742, Avril, p. 273; Seyfert, p. 114; Coll. Acad.; communication of M. Pilla to M. Perrey.
— 20.	Ditto	Several shocks during the day. A violent one at 5 <sup>h</sup> 25 <sup>m</sup> , from (or to?) the S.E., and lasting 10 or 12 secs. More of considerable violence up to the 20th hour of the 21st.		The weather, at the time of the principal shock, was rainy. At night a strange light, which is ill described, was seen; probably an aurora borealis.	Ditto.
— 25. From the 20th to the 23rd hour.	Leghorn	The ground was in continual agitation during the time mentioned.			Ditto.
— 26.	Ditto	Slight but very numerous shocks.			Ditto.
— 27. 1 P.M.	Ditto, at Pisa, Genoa, and as far as Lastra near Florence. (According to M. Pilla, from Genoa to Cincina.)	Three terrible shocks, lasting 30 or 32 secs., and ending with a violent gyratory motion. Followed occasionally, up to the 18th March, by slight shocks.		Accompanied by a horrible subterranean noise. The atmosphere brilliant and the air calm. The weather became now very cold. Some buildings were thrown down, and many walls cracked. (Amongst these shocks M. Pilla distinguishes four as having been much more violent than the rest, namely, those of the 16th at 3 <sup>h</sup> , of the 19th at noon, of the 20th at 5 <sup>h</sup> , and of the 27th at 18 <sup>h</sup> . The hours here do not perfectly agree with those given by the other authorities here quoted.)	Ditto.
— May 9. 9 <sup>h</sup> 45 <sup>m</sup> A.M.	Lima and Arequipa in Peru.	Lasted nearly a minute. Followed by numerous slight shocks up to the 10th.			Ulloa's Travels in South America, in Pinkerton's Voyages and Travels, vol. xiv. p. 590.

1742. May 19. Ditto Midnight.	.....	Lasted about the same time as the last.	.....	Ditto.
— 27. Ditto 3 <sup>h</sup> 35 <sup>m</sup> P.M.	.....	One violent shock, lasting nearly two mi- nutes, and ending with slight tremblings.	.....	Ditto.
— June 12. Ditto 5 <sup>h</sup> 45 <sup>m</sup> A.M.	.....	Lasted one minute	.....	Ditto.
— Aug. Naples.	.....	One shock	.....	Journ. Hist. Nov. 1742, p. 355.
Night be- tween 17 and 18.	.....	.....	.....	Ulloa, <i>loc. cit.</i>
— Oct. 14. Lima and Arequipa in Peru.	.....	Lasted one minute	.....	Kracheninikow in Chappe d'Ante- roche, p. 337.
— Nov. .... Poronissir, one of the Kurile islands.	.....	.....	.....	Collection Académique.
— In Abruzzo	.....	"A subterranean com- motion."	.....	Gazette de France, 12 Avril, 1776.
— Malta	.....	.....	.....	Montgomery Martin, Hist. of the Brit. Col. vol. v. p. 431.
— Zante	.....	One violent shock	.....	Toaldo, <i>loc. cit.</i>
1743. Feb. 20. Padua	.....	One shock	.....	Journ. Hist. 1743, Mai, p. 353; Juin, p. 436.
— March. Province of Otranto; Beginning of the month.	.....	Very violent shocks	.....	Mém. des Savants Étranger. t. iv. p. 118.
— 7. Toulouse, Bordeaux, Moissac, Castel-Sar- rezin, and all along the Garonne.	.....	Two shocks with an interval of six mi- nutes.	.....	Buspredigt des Pfarrers, A. J. Buxtorf (Basel, 1755, 4to).
— 9 <sup>h</sup> 15 <sup>m</sup> P.M.	.....	One shock	.....	Bertrand; Coll. Acad.
— Oct. 8. Bale	.....	A very sensible shock	.....	Accompanied by a subterranean humming noise. Probably only the same with the last, the month being mistaken.
— Nov. 8. Ditto	.....	.....	.....	Did some damage in the northern part of the island.
Between 8 and 9 A.M.	.....	.....	.....	.....
— Cephalonia	.....	.....	.....	.....
— Lima and Tarqui in Peru.	.....	Tremblings at these places three times during the year.	.....	.....
— Jan. 1. Near Hernösand	.....	A slight earthquake.	.....	.....
1744. Jan. 1.	.....	.....	.....	Acad. des Scien. de Stockholm, 1748.

1.	2.	3.	4.	5.	6.
1744. Feb. 22. — May 16. Between 11 p.m. and midnight. — June 3. 10 <sup>h</sup> 13 <sup>m</sup> a.m.	In the kingdom of Naples; especially at Lecce. Quebec in Canada ..... Cambridge in New England, North America.	A considerable vibration. The shock was not violent.		Furniture was sensibly agitated..... The subterranean bellowing noise was very great. The day was bright and hot; the wind (which was light) in the morning W.S.W., in the afternoon N.N.W. The barometer fell on the morning of the earthquake about two lines. The weather was very hot and dry both in the preceding and succeeding parts of the month. There had been no rain since the 23rd May. During the latter part of the month much lightning was observed. Attendant on the commencement of an eruption of Etna which lasted until the following year.	Seyfart, p. 114, quotes Genealog. Nachrichten, Th. 59, S. 1015. Mém. de l'Acad. des Sc. 1745, p. 218. Phil. Trans. vol. 1, p. 14.
— — — 13. In Sicily .....				Accompanied by a loud noise. The houses were shaken, but it was not perceived by persons on foot in the open country or out of the house. It had been very cold on the 5th and 6th, but on the 7th the thaw suddenly came, contrary to all expectation. According to some authorities it appeared to advance 16 leagues per hour, and according to the Acad. de Stockholm it passed from Asersald to Christiansand (8 or 10 miles) in thirty minutes, and from a place distant 4 miles from Staden to Staden in fifteen minutes. The most of these shocks were felt at night; especially towards morning. They were more violent in the lower than the upper town, and experienced both during complete calms and when the wind was blowing freshly. The writer says that shocks here are more frequent at the equinoxes than at other times, especially during the spring one. Accompanied by a loud noise .....	Seyfart, p. 114, quotes Genealog. Nachrichten, Th. 59, S. 1015. Coll. Acad. t. ix. p. 63; Acad. des Sciences de Paris, 1745, p. 15; Richard, Hist. des Météores, t. viii. p. 498; Acad. des Sciences de Stockholm, 1747, p. 233.
1745. Feb. 7. About 9 a.m.	Christiansand in Norway, and the country round. It extended as far as the sea, and even to the Hellesand Isles. It was felt at Asersald, and Staden, near Christiansand, and the same day at Copenhagen.	A trembling which lasted two or three minutes.			Coll. Acad. t. ix. p. 63; Acad. des Sciences de Paris, 1745, p. 15; Richard, Hist. des Météores, t. viii. p. 498; Acad. des Sciences de Stockholm, 1747, p. 233.
— Mar. 18 to June 20.	Smyrna .....	Twenty slight shocks, of which four were felt between March 18 at 4 p.m. and the following day.			Mercure de France, Mars, 1746, p. 80.
— July 9. 3 or 4 a.m.	Beziers (department of Hérault) in France. Corfu .....	Slight trembling ..... One shock .....		The government-house, the bishop's palace, and many other houses thrown down.	Acad. des Sciences de Paris, 1745, p. 15; Coll. Acad. t. ix. p. 63. Montg. Martin, Hist. of the Brit. Col. vol. v. p. 327.

1746. Jan. 6. Around Hernösand in 1 P.M. Angermannland.	.....	.....	.....	v. Hoff; Acad. des Sciences de Stockholm, 1748, p. 156.
Feb. 2. Boston in New England. Between 9 and 10 P.M.	A slight shock.	.....	.....	Silliman's Journal, vol. xl. p. 206.
July 9. Barga in Tuscan	Some slight shocks	.....	.....	Relazione giornaliera del tremuoto seguito in Barga l'anno 1746; nel mese di Giugno, compilata dal dott. F. Tallinuci.
10. Ditto	Ditto	.....	.....	Ditto.
11. Ditto	One very violent shock	.....	.....	Ditto.
18th hour.	Ditto. Followed by numerous other slight shocks, gradually becoming less violent up to the 23rd.	.....	.....	Ditto.
21st hour.	An extremely violent shock. The agitation of the ground ceased the next day.	.....	.....	.....
23. Ditto	.....	.....	.....	.....
22½ hour.	.....	.....	.....	.....
Oct. 28. Lima and Callao in Peru, and all the country near along the coast.	The first shock at the hour mentioned, followed by 200 ing, and returning with more in twenty-four overwhelming violent hours. The shocks continued at intervals up to the 24th ordinary level. A port Feb. 1747, during which period 451 near this, producing a bay. Four other hours, viz. Cavallos, Guannape, Changay, and Gaura, met with the same fate as Callao.	.....	.....	Hist. de l'Acad. des Sciences de Paris, 1746, Hist. p. 24; Bouguer, de la Figure de la Terre, p. 73; Hist. gén. des Voyages, t. xix. p. 311; t. xx. p. 31; v. Humboldt, Voyage, t. i. p. 319.
10½ 30 <sup>m</sup> P.M.	More violent than any shock before felt that year.	.....	.....	Bertrand; Coll. Acad.
In the Haut-Valais	.....	.....	.....	.....



1.	2.	3.	4.	5.	6.
1747. May 21. 14 <sup>h</sup> 45 <sup>m</sup> .	Padua .....	One shock .....	.....	.....	Toaldo, <i>loc. cit.</i>
— July 25. 4 P.M.	Bygdea in Westerbottn; Sweden.	Tremulous, lasting two minutes, and appar- ently from S.W. to N.E.	.....	In many places the roofs cracked, and the win- dows rattled. A clap of thunder was heard while the atmosphere was quite clear, and, an hour after, another like an explosion from a cannon.	Acad. des Sciences de Stockholm, 1750, p. 158.
— Oct. 17.	At sea, on board the ves- sel <i>Le Prince</i> , Captain Bobriant, going to the West Indies, in lat. 1° 35' S., long 20° 10' W.	One or two shocks were felt as if the vessel had touched the ground.	.....	.....	Daussy in the Comptes Rendus de l'Acad. t. vi. p. 514.
— .....	Foligno, Norcia, and some other adjoining towns.	A violent shock .....	.....	Several houses thrown down .....	Journ. Hist. Juillet, 1747, p. 46.
— .....	Venice .....	.....	.....	.....	Seyfert, p. 118; v. Hoff.
— .....	Toulouse .....	.....	.....	.....	Ditto.
— .....	Pennsylvania .....	.....	.....	.....	Ditto.
1748. Mar. 12. 11 A.M.	Along the coast of Her- nosand for 10 miles.	.....	.....	Probably this date is according to Old Style, and therefore equivalent to the 23rd N.S. If so it would be simultaneous with the next.	Acad. des Sciences de Stockholm, 1748, p. 154.
— 23. 6 <sup>h</sup> 45 <sup>m</sup> A.M.	In the kingdom of Va- lencia in Spain.	Tremulous. Lasted two minutes.	.....	.....	.....
— April 2. 9 <sup>h</sup> 30 <sup>m</sup> P.M.	Ditto. Felt at Valencia, Alicant, Carthagena, Orihuela, San Phi- lippe, Alzira, &c.	As violent as the last, but not so prolonged.	.....	.....	.....
— 18. Between 6 and 7 P.M.	In the neighbourhood of Vevey.	One shock, followed by another less violent, a quarter of an hour after.	.....	.....	.....
— July 12. (N.S.) Be- tween 10 and 11 P.M.	Taunton in Somerset- shire and the country from the English Channel to the Severn, and extending about the same distance East and West, being felt at the same time at Exeter and Crookhorn.	Direction = S.E. to N.W.	.....	The shock appeared to come from a distance, and was accompanied by a noise like that of a waggon in motion. Those who were sitting felt their seats move under them, and those who were in bed were awakened by a sudden start. China and kitchen utensils were thrown about, and here and there bells were heard to ring. v. Hoff mentions two earthquakes at this place, viz. on the 1st July, 1747, and on the 1st or 11th June, 1748. Both dates appear to be erroneous.	Phil. Trans. vol. xlv. p. 398; vol. xlv. p. 690.

1748. ....	Madeira .....	A violent earthquake.	.....	.....	.....	Ditto, vol. xix. p. 435.
1749. Apr. 22. (N.S.) 5 A.M.	Neufchatel and the neighbourhood.	Followed by several other slight shocks during the day.	.....	.....	The wells became muddy, and moveable utensils clattered against each other.	Gentleman's Magazine, vol. xix. p. 190.
— June 8.	Vienna, and the environs.	A trembling for one minute.	.....	.....	.....	Journ. Hist. Août, 1749, p. 128.
— 9.	Ditto .....	Another on this day .....	.....	.....	.....	Ditto.
— 12	Ditto .....	Ditto .....	.....	.....	These shocks were more violent in the country round than at Vienna itself. At Neustadt a convent was thrown down.	Ditto.
Oct. 11. 7 P.M.	In France, extending for 60 leagues, from Poitou beyond Luçon to the neighbourhood of Blois.	.....	.....	.....	Accompanied by a noise like the rattling of waggon wheels upon a pavement which lasted a minute and a half. The letter of Reaumur to the Royal Society describing this event is dated 1749, yet it appears almost certain that it should be 1750, and that the earthquake happened in that year. <i>Vid. supra.</i>	Phil. Trans. vol. xli. pp. 689, 691.
—	Olveabygden in Aarnæs-Syssel; Iceland.	A very destructive earthquake.	.....	.....	On the 27th March (at night), 23rd Sept. and 25th Nov. according to the Memoirs of the Stockholm Academy, subterranean noises were heard at Bygdea in Sweden. v. Hoff, though quoting from the German translation of the same work, does not mention the last two dates, and says for the first, "Erschütterung zu Bidea in Westerbottin."	v. Hoff.
—	Country around the volcano of Colima in Guanaxtlan, Mexico.	.....	.....	.....	Ruined Zapotlan. Accompanied by an eruption of the volcano.	Sonneschmidt, Mineralogisch. Beschreibung, der vorzüglichsten Bergwerke Mexicos, p. 307.
1750. Jan. 28. 2 P.M.	Rome. Also at Frascati and Albano.	An hour after, another slighter shock, and during the night, a third of greater violence.	.....	.....	At Frascati and Albano some houses were injured.	Journ. Hist. Mai, 1750, p. 385.
— Feb. 11.	Rome .....	Very sensible shocks	.....	.....	.....	.....
— 19. (N.S.) About 12 <sup>30</sup> noon.	Eltham in Kent, eight miles S.E. from London Bridge.	Two shocks from E. to W.	.....	.....	The wind from the S.W., which had been high the night before and during the morning, had ceased, and for some time after it was quite calm. Some pigeons seemed much frightened. As the time was not minutely observed this event probably did not precede that in London by ten minutes.	Kant, Géog. Phys. (Italian translation, Milan, 1809) t. iv. p. 312. Phil. Trans. vol. xvi. Appendix.

1.	2.	3.	4.	5.	6.
1750, Feb. 19, 12 <sup>h</sup> 40 <sup>m</sup> noon.	London and the country for seven miles round, at Tooting, Chelsea, &c.; especially violent on both sides of the Thames from Greenwich to Richmond. Also at the same time on the coasts of Normandy (at Havre and Boulogne), Picardy and Brittany. Canstadt in Swabia ...	A violent shock .....	Many vessels in the middle of the Thames felt a violent shock.	Some persons spoke of a former slight shock at London at 7 A.M., and also of one at Plymouth at 1 A.M. on the following day. Both appear to be very doubtful. v. Hoff has obviously copied incorrectly the shocks in England of this year.	Phil. Trans. vol. xvi. Appendix.
— Mar. 10.	Canstadt in Swabia ...	A trembling .....	.....	Kefenstein mentions an earthquake at Constance v. Hoff. on the same day, but v. Hoff thinks this name is only mistaken for Canstadt.	Phil. Trans. loc. cit.
— 19. (N.S.) Midn' (of the 18th)	London and some other places in the neigh- bourhood.	A slight shock .....	.....	.....	.....
— 2 A.M.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 3 A.M.	Chelsea .....	Ditto .....	.....	.....	Ditto.
— 5 <sup>h</sup> 40 <sup>m</sup> A.M.	London, Chesnut (Ches- nut hunt?), Hertford, Cophall, Bromley, Croydon, Tooting, Chelsea, Fulham, Epsom and Turn- ham.	Three or four consecu- tive shocks in the space of 10 or 12 secs. (or, according to some, only 3 or 4). Direction at London said to be E. to W., in the neighbour- hood from N.E. to S.W., or even from N.W. to S.E. Others believed they felt alternate vi- brations from N.W. to S.E., and vice versa. At Chelsea two figures of porcelain, which had been placed with their faces to the W., were found after the shock turned to N.E.	.....	.....	.....

2 A.M.	bourhood.	Ditto. Lasted some minutes. (Probably a mere trembling.)	Ditto.	
4 A.M.	Ditto			
—	Frascati near Rome.....	A trembling.....		Kant, <i>loc. cit.</i>
—	In the South of France.	Several shocks		Acad. des Sciences de Paris, 1750, p. 36; Mém. des Sav. Étr. t. ii. p. 612; Coll. Acad. t. x. p. 178. Phil. Trans. <i>loc. cit.</i>
—	East Molesey in Surrey.....	A trembling.....		
(N.S.) Before 4 A.M.				
—	The Isle of Wight			Ditto.
(N.S.) Between 3 and 4 A.M.				
6 P.M.	Ditto, at Portsmouth, Bridport, Southampton, Bath, Northaw, Gubbins, Hatfield (not felt at Hertford), Hackney near London, &c. Also in Jersey and Guernsey.	Direction at Portsmouth (where the shock was but slight) at E. to W. Lasted four or five seconds. At Hackney the direction was W. to E.	Accompanied at most of these places by a noise like thunder at a distance. At Hackney, however, no noise was heard. The weather had been alternately wet and fine for a week before; there had been rain before 6 o'clock on the 29th, and a stormy cloud was seen at the moment of the shock. The time given for Portsmouth is 5 <sup>h</sup> 45 <sup>m</sup> or 6 <sup>m</sup> .	Ditto.
— April 13. (N.S.) 10 P.M.	Extended from Lancaster to Wrexham in the direction N. to S. and from Flintshire to Stockport and Altringham in that of W. to E.	Rather violent at Chester and Manchester. Slighter at Liverpool, where the motion was undulatory from N. W. to S. E. and lasted two or three seconds.	At Barnhill the houses were violently agitated; at Downing in Flintshire a bed upon castors was moved from its place. Accompanied by a noise compared to thunder, wind, &c. The heavens were obscured by a thick mist, in which red rays were observed converging towards a point near the zenith. This appearance lasted fifteen or twenty minutes (aurora borealis?).	Ditto.
— Before May 11.	Jamaica	Many shocks		Journ. Hist. 1750, Oct. p. 300 (quoting letters from Jamaica of May 11). Gentleman's Magazine, vol. xx. p. 282.
— May 12. (N.S.)	Cerigo	Lasted five minutes.		
— 5 A.M.	Hammerdal in Jämtland; Sweden. Also in the parishes of Lit and Riddön, extending 8 miles.	Apparent direction = N. E. to S. W. The shocks more to the South did not take place for half an hour afterwards.		Mém. de l'Acad. de Stockholm, 1750.

1.	2.	3.	4.	5.	6.
1750, May 15. (N.S.) 10 A.M.	Winbourn in Dorsetshire, and the country for 20 miles round.	One violent shock ...		Accompanied by a noise like the discharge of artillery.	Phil. Trans. <i>loc. cit.</i>
— — — 23.	In Calabria ...	Several shocks ...		Probably only the same with the last ...	Kant, <i>loc. cit.</i> v. Hoff.
— — — 24.	Simultaneously in Calabria and at Florence.	Ditto, repeated on the 25th.			
— — — 25.	Several parts of the South of France, in and about the Pyrenees. Felt at Rodez, Montpellier, Narbonne, Toulouse, Medoc, Pons in Saintonge, Bordeaux, and for 12 leagues to the West of this last place.	Many very violent shocks, renewed at some places all through the month of June. At Tarbes four shocks were felt from 10 at night to 5 the next morning, and on the 26th, three more.		The shocks were most violent in the Pyrenees. Masses of rock were thrown down in the valley of Lavedan. Several houses also were thrown down, and at Tarbes an old tower. Preceded by subterranean murmurings.	Gazette de France, 1750, No. 28; Mém. de l'Acad. de Paris, 1750, p. 36; Mém. des Sav. Étr. t. ii. p. 612; Coll. Acad. t. x. p. 178.
— June 7.	In the Morea and the island of Cerigo.	Very violent ...		In the island of Cerigo the town was ruined and more than 2000 persons perished.	Journ. Hist. Sept. 1750, p. 217; Phil. Trans. <i>loc. cit.</i> p. 734.
— — — 21 to 28.	Tarbes (Hautes Pyrénées.)	Several violent shocks, slight ones having been felt there from the 24th May.			Mém. de Toulouse, t. ii. H. p. 15.
— — — 24.	Munich and Landshut.	Three shocks at Munich; the first in the evening, the second, more violent, at midnight, and the third at 1 A.M. the following morning.		All the 25th a violent wind, which threw down houses in the open country, and a thunder-storm with hail. The lake overflowed its banks.	Journ. Hist. Sept. 1750, p. 212; v. Hoff.
— Aug. ... Sept. 3. (N.S.) 6 <sup>h</sup> 45 <sup>m</sup> A.M.	Gibraltar ... In the counties of Lincoln and Nottingham. Felt at Spalding, Newark, Grantham, Stamford, and Milton near Peterborough.	One shock ... Ditto		Accompanied by noise. The air was quite calm. The same night an aurora borealis was seen at the same places.	v. Hoff. Phil. Trans. <i>loc. cit.</i>
— Oct. 5.	A large tract on the north coast of Africa.	Ditto ... A trembling			v. Hoff. Ditto.

AND P.M.	AVANG, AND LINCOLN, in England; extending W. to E. from Warwick to Bury in Suffolk, and N. to S. from Lincoln to Northampton.	SOURCE OF SHOCK, OR, according to others, of twenty seconds.	EARTHQUAKES TO THE agency of electricity; these shocks followed the course of the rivers and canals, which acted as conductors.	HAVING EXPERIENCED THESE SHOCKS, ACCOMPANIED BY A loud noise from N.E. to S.W. or <i>vice versa</i> . At Northampton the houses of a street running N. and S. were more shaken on the East side than on the West. Some chimneys were thrown down. The weather was calm and fine. Auroræ boreales had been frequently seen for some time before. Accompanied by a loud detonation. Obviously the same earthquake with that in England.	Acad. des Sciences de Paris, 1750, p. 36; Mém. des Sav. Étr. t. iv. p. 118; Coll. Acad. t. x. p. 178.
—	In Brittany, extending from Cherbourg to Avranches, and as far as Bayeux.	A very slight shock.			Kant, Géog. Phys. loc. cit.; Kéferstein.
—	At Naples, and in the Romagna.	Tremblings			Kéferstein.
—	16. In Lapland	One shock			Gentleman's Magazine, vol. xx. p. 478; Journ. Hist. Déc. 1750, p. 466.
—	In Romania; especially at Philippopoli.		The river Maritza quitted its bed, and inundated the surrounding villages.		v. Hoff.
—	Dec. 22. Felt at Naples, Venice, and Schaffhausen.	A trembling			Kéferstein.
—	At St. Pölten in Austria.	One shock			Phil. Trans. vol. xlix. pt. i. p. 410.
—	Liabon	One violent shock			Ditto, pt. ii. p. 458.
—	Luçon, one of the Philippine Isles.		Accompanied by a volcanic eruption under a lake, which lasted three months, and by which seven new islands were produced in the lake.		Kéferstein.
1751 Feb. 3. Jamaica					v. Hoff.
— 15. Nantes in Brittany		A trembling motion			Ditto.
Mar. 30. On the banks of the lower Loire.		The Ditto			Ditto.
April ... Angers in the department of the Maine and Loire.		Ditto			Ditto.

1.	2.	3.	4.	5.	6.
1751. May 6. Staffuanger in Norway. (N.S.)		Lasted one minute			Gentleman's Magazine, vol. xxi. p. 235.
Between 12 and 1 at night.	25. St. Domingo				An account in ditto, same vol.
June 5.	In the neighbourhood of Naples; at Rome and Florence.	Several shocks.			v. Hoff, S. ii. B. 331.
July 11.	In Sicily	Ditto			Kerstein.
19.	At Nocera and Gualdo in the Apennines.				v. Hoff, <i>loc. cit.</i>
At night.	26. Ditto, and other places in Umbria. Also at Rome.	Reiterated violent shocks for two hours in Umbria.		The city of Gualdo especially injured	Journal Historique, Oct. 1751, p. 308; Kant, Géog. Phys. <i>loc. cit.</i>
Aug. ...	Gubbio, some other parts of Italy, and at Palermo.	Several shocks.			Kant, <i>loc. cit.</i>
Sept. 15. 10 P.M.	Among the Antilles, especially at St. Domingo.	Several shocks. At Martinique they lasted but a short time.		The afternoon had been wet. Lightning in the evening. A little after 11 o'clock the thunder began.	De Chamvallon, Voy. à la Martinique, p. 144-155; Acad. des Sciences, 1752, p. 16; Journ. Hist. Avril, 1752, p. 318.
29. St. Domingo					Ditto.
Oct. 1. 8 <sup>h</sup> 30 <sup>m</sup> A.M.	In Umbria				Kant, <i>loc. cit.</i>
12. Ditto	1. Martinique	A slight shock.		The weather fine with light clouds	De Chamvallon, and the other works just quoted.
At noon.	8. St. Domingo				Gentleman's Magazine, vol. xxi. Ditto.
18. Ditto					
2 P.M.		Two shocks with a very short interval; the motion lasting at least three minutes at each shock.		The weather very fine and perfectly calm; not a breath of wind in motion.	Ditto.
3 <sup>h</sup> 30 <sup>m</sup> P.M.	Ditto; and at Martinique. Also probably at some of the other islands.	The earth trembled slightly for two or three seconds.		The barometer did not vary during the earthquake. The wind was moderate, and the sky clouded.	De Chamvallon, &c. <i>loc. cit.</i>
5 P.M.	St. Domingo				Gentleman's Magazine, <i>loc. cit.</i>

1751. Oct. 23. In Naples and towards Slight 17 <sup>h</sup> (Italian time) .....	.....	.....	Vesuvius was in eruption from the 19th of this Della Torre, p. 126. month to the 9th November.	.....
— 27. In Finland .....	.....	.....	The houses trembled. A noise was heard in the air.	Collection Académique, t. xi. p. 14.
— 10 P.M. ....	.....	.....	.....	Gentleman's Magazine, <i>loc. cit.</i>
— 8 P.M. ....	.....	.....	.....	Kant, <i>loc. cit.</i>
— Nov. 5. In Finland .....	.....	.....	Shocks again accompanied by noise .....	Collection Académique, <i>loc. cit.</i>
— 9 A.M. ....	.....	.....	.....	.....
— 7. Swanak in Finland .....	.....	.....	Possibly confounded with one of those given by the Collection Académique.	Kant, <i>loc. cit.</i>
— At night. ....	.....	.....	Again accompanied by noise .....	Collection Académique, <i>loc. cit.</i>
— 18. Ditto .....	.....	.....	More shocks with noise .....	Ditto.
— From 1 to 7 A.M. ....	.....	.....	.....	.....
— 19. St. Domingo .....	.....	.....	Slight tremblings had been felt almost every day since the 1st.	Gentleman's Magazine, <i>loc. cit.</i>
— 3 <sup>h</sup> 20 <sup>m</sup> P.M. ....	.....	.....	.....	.....
— 21. Ditto .....	.....	.....	Port-au-Prince was completely ruined. A portion of the coast, twenty leagues in length, sank into the sea. Horses, sheep, and oxen by their irregular motions and cries, showed their fear, and birds durst not alight on the ground.	Hist. de l'Acad. de Paris, &c. before quoted, and Gent's Mag. <i>loc. cit.</i>
— 8 A.M. (Per- rey gives the hour 7 <sup>h</sup> 50 <sup>m</sup> .)	.....	.....	.....	.....
— Ditto .....	.....	.....	.....	Gentleman's Magazine, <i>loc. cit.</i>
— 10 A.M. ....	.....	.....	.....	Ditto.
— 5 P.M. ....	.....	.....	.....	.....
— Genoa. (Also felt in the country about Milan.)	.....	.....	The sea was so much agitated that vessels were nearly wrecked.	Journ. Hist. Pér. 1752, p. 150; Kant, <i>loc. cit.</i>
— 22. St. Domingo .....	.....	.....	.....	Gentleman's Magazine, <i>loc. cit.</i>
— 4 and 6 A.M. and 3, 4, 8, and 11 P.M. ....	.....	.....	.....	.....
— 23. Ditto .....	.....	.....	.....	Ditto.
— 1 <sup>h</sup> and 5 A.M. and 1 <sup>h</sup> 4 <sup>h</sup> and 3 <sup>h</sup> 20 <sup>m</sup> P.M. ....	.....	.....	The shocks were felt on board ships more than 100 leagues from the island, the sensation being as if the ship had struck.	.....



1.	2.	3.	4.	5.	6.
1751. Nov 24. 6½, 7½, 10, and 11¼ A.M.	St. Domingo	More shocks			Gentleman's Magazine, <i>loc. cit.</i>
— 25. 6½, and 7½ A.M. and 2 and 3 P.M.	Ditto	Ditto			Ditto
— 26. 4½, 7½, and 8½ A.M.	Ditto	Ditto			Ditto.
— 28. 8¼ A.M.	Ditto	Two very violent shocks.			Ditto.
— 30. 8¼ A.M.	Ditto	One violent shock			Ditto.
— Dec. 1. 7 P.M.	Ditto	Described as a quick strong tremor.			Ditto.
— — —	Genoa	Less violent than the shock of the 21st of November.			Journ. Hist. Fév. 1752, p. 150.
— — —	Naples	A trembling			V. Hoff.
— — —	St. Domingo	More tremblings			Gentleman's Magazine, <i>loc. cit.</i>
2 A.M.	In Finland	One slight shock			Collection Académique, <i>loc. cit.</i>
8 A.M.	St. Domingo				Gentleman's Magazine, <i>loc. cit.</i>
7½ A.M.					
— 14.	In Finland				Collection Académique, <i>loc. cit.</i>
7 A.M.					
— 19.	Province of Tra- los-Montes in Portugal.	Violent			Journ. Hist. Mars, 1752, p. 227.
— 25.	In Finland				Collection Académique, as before.
3 P.M.					

1751.	Gap in Dauphiny	A trembling			Moniteur, 10 Avril, 1808. v. Hoff.
—	At Venice				Schlözer, Neue Erdbeschreibung von America, Th. ii. S. 700.
—	St. Jago di Guatemala				Mém. des Sav. Étr. t. iv. p. 118.
1752. Jan. 12.	Toulouse and in the Pyrenees.	Two shocks in two minutes.			v. Hoff; Kefenstein.
—	Frontello, not far from Mantua.	A trembling			Seyfart, p. 121.
—	Torre de Moncorvo in the province of Trallos-Montez, Portugal.				Ditto, p. 125; v. Hoff.
—	In Chili, at Concepcion, and on the island of Juan Fernandez. Also, according to some accounts, felt at Port-au-Prince in St. Domingo.				Possibly confounded with the St. Domingo earthquake of the year before, though this does not seem probable.
—	Feb. 23. Dartmoor in Devonshire, and the neighbourhood.				Mrs. Bray's "Borders of the Tamar and Tavy," vol. i. p. 310.
—	— 26. Some parts of Sweden, especially at Fahlun and in Dalarna.	A slight trembling, which did not last long.			Seyfart, p. 120.
—	Mar. 16. Stavanger in Norway	A considerable shaking motion.			Ditto, p. 121.
—	— 27. At the mouths of the Mondego and Vouga, at Aveiro in Portugal.	A violent trembling.			Ditto, p. 122.
—	— 31. Bristol and other places in Somersetshire.	A considerable shaking from S. to N.			Ditto, p. 121.
(N.S.) 11 <sup>h</sup> 30 <sup>m</sup> A.M.	April 15. Stavanger in Norway	Several violent shocks, lasting several minutes.			Gazette de France, 10 Juin, 1752; Seyfart, p. 122.
— 4 P.M.					The weather was remarkably fine until 2 o'clock, when a small cloud rising extended itself over the heavens, and the whole evening there was a violent storm of wind, hail, and thunder and lightning; followed during the night by the appearance of a strange star of an octagonal shape, which seemed to throw forth balls of fire from its angles (!). Keilhau gives the date the 16th.

1.	2.	3.	4.	5.	6.
1752. April 16. ....	In Somersetshire .....	Violent.....	Attended with inun- dations.	.....	Kant, Géog. Phys. t. iv. p. 313.
— May 28. ....	At Burcos and Aveiro in Portugal.	.....	.....	.....	Seyfart, p. 121; Gazette de France, 3 Juin.
Between 2 and 3 A.M.	.....	.....	.....	Unaccompanied by damage	Seyfart, p. 122; v. Hoff.
(N.S.) 5 P.M.	Constantinople and Adrianople.	Not very great	.....	.....	Phil. Trans. vol. xlix. Pt. I. p. 116; v. Hoff; Gazette de France, Gazette de France, 8 Juillet.
— June. At the begin- ning of the month.	At Nocera in Umbria. Those Also at the same time in the Marches of An- cona.	More shocks. Those in the Marches of Ancona slight.	.....	.....	.....
— June. At Zante .....	.....	A violent earthquake, lasting two minutes.	.....	Many of the principal streets of the capital were ruined, and one of the highest towers of the castle thrown down.	Seyfart, p. 123; v. Hoff.
5. At night.	At Riccia, Albano and Genzano in the southern part of the States of the Church.	One shock	.....	v. Hoff places at this time the shocks at Nocera, &c. just mentioned. Kant gives the date July for both.	Seyfart, p. 124.
— 22. At Leghorn .....	.....	Ditto	.....	.....	Ditto.
— July 13. At Urbino, Gubbio, Gu- aldo, Foligno, and Fa- briano.	.....	Ditto	.....	.....	Gazette de France, 19 Août.
— 21. At Tivoli .....	.....	Ditto	.....	.....	Ditto.
3 A.M.	.....	.....	.....	.....	.....
(N.S.) 8 P.M.	Adrianople. Also at the same time at Constanti- nople and Smyrna.	Very violent at Adria- nople and Constanti- nople, slight at Smyr- na. At Constantino- ple there was a trem- bling in a perpendi- cular direction for se- veral seconds, and then three or four regular horizontal shocks from N.W. to S.E., i.e. in the direction of Adria-	.....	At Adrianople clefts opened in the earth from which there came out water smelling of sul- phur. Mosques and houses were much injured. The wind at Constantinople was in the morn- ing S., in the afternoon E.S.E. and very vio- lent. It remained so during the earthquake.	Phil. Trans. loc. cit.; Gazette de France, 30 Sept., 6 Janv.; Huot, loc. cit.; Journ. Hist. 1753, Fév. p. 149; Kant, loc. cit.

— Sept. 6.	Spoleto .....	ring the whole month. A trembling .....	On the same day a storm at sea.	Accompanied by noise .....	Keferstein. Hist. de l'Acad. de Paris, 1752, p. 16; Coll. Acad. t. xi. p. 55; Gazette de France, 30 Sept. 1752.
— 9.	Rom and Clermont in Avergne, and the neighbourhood. Rampiz, a village on the Oder.	A shock, first from N. to S.; then from S. to N. A trembling motion, lasting scarcely half a minute. A trembling .....	storm at sea.	Attended by a storm of lightning and hail .....	Seyfart, p. 125.
— At night.	26. At Frasigli, Marino, Ve- letri, and also (though but slightly) at Rome. Adrianople .....	A trembling .....			Ditto, p. 126.
— Oct. Be- ginning of the month.	In the duchy of Urbino .....	Frequent shocks du- ring the month. Repeated shocks, which lasted until the 9th of Decem- ber following. Tremblings .....			Phil. Trans. &c., quoted under July.
— 16. Salerno .....	16. Salerno .....	Repeating .....			Gazette de France, 11 Nov., 6 Janv. suiv.
— 19. Veletri .....	19. Veletri .....	Tremblings .....			Seyfart, p. 126.
— At night.	23. Herulanum, Torre del Greco, and all along the coast at the foot of Veavivus. Naples .....	Ditto .....			Ditto.
— Nov. 9. 5 <sup>h</sup> 30 <sup>m</sup> A.M.	29. Naples .....	A slight trembling .....		The wind N.E. The weather hot .....	Seyfart, loc. cit. Phil. Trans. loc. cit.; Journ. Hist. loc. cit.
— 10.	Hernösand in the Swe- dish province of An- germanland. Ditto .....	Ditto. The same felt several times more in the course of the month. A second shock .....			Seyfart, p. 127-8.
— 17. Ditto .....	17. Ditto .....	A second shock .....			Ditto.
— 21. Ditto .....	21. Ditto .....	Three shocks .....		Accompanied by a loud noise, brilliant light in the heavens, and an auroral arch.	Keilhau in his memoir on Norwegian earthquakes quotes Gisaler.
— 28. Ditto .....	28. Ditto .....	Lasted one minute .....			Seyfart, loc. cit.
7 <sup>h</sup> M. Dec. Be- ginning of the month.	Sienna in Tuscany .....	Three shocks .....			



Gap in Dauphiny	A trembling			Moniteur, 10 Avril, 1808. v. Hoff.
At Venice				Schlözer, Neue Erdbeschreibung von America, Th. ii. S. 700.
St. Jago di Guatemala				Mém. des Sav. Étr. t. iv. p. 118.
Jan. 12. Toulouse and in the Pyrenees.	Two shocks in two minutes.			A noise was heard like that of a forge blown by bellows. Much snow fell during the night.
Frontello, not far from Mantua.	A trembling.			v. Hoff; Kefenstein.
Torre de Moncorvo in the province of Trallos-Monta, Portugal.				Seyfart, p. 121.
In Chili, at Concepcion, and on the island of Juan Fernandez. Also, according to some accounts, felt at Port-au-Prince in St. Domingo.				Possibly confounded with the St. Domingo earthquake of the year before, though this does not seem probable.
Feb. 23. Dartmoor in Devonshire, and the neighbourhood.				Mrs. Bray's "Borders of the Tamar and Tavy," vol. i. p. 310.
— 26. Some parts of Sweden, especially at Fahlun and in Dalarna.	A slight trembling, which did not last long.			Seyfart, p. 120.
Mar. 16. Stavanger in Norway	A considerable shaking motion.			Ditto, p. 121.
— 27. At the mouths of the Mondego and Vouga, at Aveiro in Portugal.	A violent trembling.			Ditto, p. 122.
— 31. Bristol and other places.	A considerable shaking from S. to N.			Ditto, p. 121.
April 15. Stavanger in Norway	Several violent shocks, lasting several minutes.			Gazette de France, 10 Juin, 1752; Seyfart, p. 122.

1.	2.	3.	4.	5.	6.
1752. April 16. In Somersetshire .....	Violent.....	Attended with inun- dations.			Kant, Géog. Phys. t. iv. p. 313.
— 28. At Buarcos and Aveiro in Portugal.	Ditto .....			Unaccompanied by damage .....	Seyfart, p. 121; Gazette de France, 3 Juin.
— May 13. Neusohl in Hungary ...					Seyfart, p. 122; v. Hoff.
Between 2 and 3 A.M.	Constantinople and Adrianople.	Not very great .....			Phil. Trans. vol. xlix. Pt. i. p. 116; v. Hoff; Gazette de France, Gazette de France, 8 Juillet.
(N.S.) 5 P.M.	At Nocera in Umbria. Those Also at the same time in the Marches of An- cona.	More shocks. Those in the Marches of Ancona slight.			
— June. At Zante .....	A violent earthquake, lasting two minutes.			Many of the principal streets of the capital were ruined, and one of the highest towers of the castle thrown down.	Seyfart, p. 123; v. Hoff.
the begin- ning of the month.	5. At Riccia, Albano and Genzano in the southern part of the States of the Church.	One shock .....		v. Hoff places at this time the shocks at Nocera, &c. just mentioned. Kant gives the date July for both.	Seyfart, p. 124.
At night.	22. At Leghorn .....	Ditto .....			Ditto.
— July 13. At Urbino, Gubbio, Gu- aldo, Foligno, and Fa- briano.	Ditto .....				Gazette de France, 19 Août.
— 21. Tivoli .....	Ditto .....				Ditto.
3 A.M.	Adrianople. Also at the same time at Constanti- nople and Smyrna.	Very violent at Adria- nople and Constanti- nople, slight at Smyr- na. At Constantinople there was a trem- bling in a perpendi- cular direction for se- veral seconds, and then three or four regular horizontal shocks from N.W. to S.E., i.e. in the direction of Adria-		At Adrianople clefts opened in the earth from which there came out water smelling of sul- phur. Mosques and houses were much injured. The wind at Constantinople was in the morn- ing S., in the afternoon E.S.E. and very vio- lent. It remained so during the earthquake.	Phil. Trans. loc. cit.; Gazette de France, 30 Sept., 6 Janv.; Huot, loc. cit.; Journ. Hist. 1753, Fév. p. 149; Kant, loc. cit.
(N.S.) 8 P.M.					

— Spoleto .....	ring the whole month.	.....	.....	.....	Kerferstein.
Sept. 6. Rion and Clermont in A shock, first from N. to S.; then from S. to N. neighbourhood.	A trembling.....	On the same day a storm at sea.	Accompanied by noise .....	.....	Hist. de l'Acad. de Paris, 1752, p. 16; Coll. Acad. t. xi. p. 55; Gazette de France, 30 Sept. 1752.
— 9. Rampiz, a village on the Oder.	A trembling motion, lasting scarcely half a minute.	.....	Attended by a storm of lightning and hail .....	.....	Seyfart, p. 125.
— 26. At Frasigli, Marino, Veletri, and also (though but slightly) at Rome.	A trembling.....	.....	.....	.....	Ditto, p. 126.
— Adrianople .....	Frequent shocks during the month.	.....	.....	.....	Phil. Trans. &c., quoted under July.
Oct. Be- In the duchy of Urbino	Repeated shocks, which lasted until the 9th of December following.	.....	.....	.....	Gazette de France, 11 Nov., 6 Jan. suiv.
— 16. Salerno .....	Tremblings .....	.....	.....	.....	Seyfart, p. 126.
— 19. Veletri .....	Ditto .....	.....	.....	.....	Ditto.
— 23. Herculaneum, Torre del Greco, and all along the coast at the foot of Vesuvius.	Ditto .....	.....	.....	.....	Ditto; Gazette de France, 2 Déc.
— 29. Naples .....	A slight trembling .....	.....	.....	.....	Seyfart, loc. cit.
Nov. 9. Constantinople .....	Ditto. The same felt several times more in the course of the month.	.....	The wind N.E. The weather hot .....	.....	Phil. Trans. loc. cit.; Journ. Hist. loc. cit.
30 <sup>th</sup> A.M.	.....	.....	.....	.....	Seyfart, p. 127-8.
— 10. Hernösand in the Swedish province of Angermannland.	A second shock .....	.....	.....	.....	Ditto.
— 17. Ditto .....	.....	.....	.....	.....	Keilbau in his memoir on Norwegian earthquakes quotes Gisler.
— 21. Ditto .....	.....	.....	Accompanied by a loud noise, brilliant light in the heavens, and an auroral arch.	.....	Ditto.
— 28. Ditto .....	Lasted one minute .....	.....	.....	.....	Seyfart, loc. cit.
Dec. Be- Sienna in Tuscany .....	Three shocks .....	.....	.....	.....	.....
— 1 <sup>st</sup> . Ding of the month.	.....	.....	.....	.....	.....



1.	2.	3.	4.	5.	6.
1752. Dec. 6. 4 to 5 A.M.	Angermannland as before.			Accompanied as before by a loud noise. A feeble streak of light appeared in the heavens extending from N.E. to S.W. in the direction of the shock, for 12 or 13 (Swedish?) miles along the coast. Balls of fire seemed to come from it. These shocks were accompanied by subterranean and aerial noises. These latter were heard in some places where the shocks themselves were not felt. The Coll. Acad. mentions four shocks here in November, and others in December, at each time lasting one or two seconds. Direction, <i>as usual</i> , from S.W. to N.E. The author adds that earthquakes are more frequent in the North towards the end of winter.	Keilhau, as before quoted.
— 29. Between midnight and 1 A.M.	Ditto				Ditto.
— End of the month.	Around Urbino	Tremblings			Seyfert, <i>loc. cit.</i>
—	In the marches of Ancona at Nocera, Santogemini, Civitella, &c. Cephalonia	Fresh shocks Violent shocks		Probably coincident with some of the Italian earthquakes already mentioned for this year. Berghaus considers these shocks as having occurred at the same time with those in Zante, <i>i. e.</i> in the beginning of June. A very thick wall was thrown down.	Journ. Hist. Août, 1752, p. 152.
1753. Feb. Beginning of the month.	At Modena	One shock			Montgomery Martin, Hist. of the Brit. Col. vol. v. p. 415. Seyfert, p. 128.
— March 9. 2 <sup>h</sup> 30 <sup>m</sup> P.M. (v. Hoff gives the hour 1 <sup>h</sup> 15 <sup>m</sup> P.M.)	In Piedmont, Savoy, and part of Switzerland— at Turin, Susa, Mont Cenis, the valleys of Lucerne and Perouse, Fenestrelles, Pignerol, Asti, and Geneva.	At Geneva it lasted two minutes.		A large opening appeared in Mont Cenis, from which torrents of water came. Similar ones were observed in the valleys of Lucerne and Perouse. In the mountains a noise like that of cannon was heard. At Geneva a bell sounded loudly.	Gazette de France, 24 Mars, 14 et 21 Avril; Journ. Hist., Mai, 1753, p. 387 et 465; Seyfert, <i>loc. cit.</i>
— 4 P.M.	Turin	Slight tremblings			Seyfert, <i>loc. cit.</i> ; v. Hoff.
— 10. ? A.M.	Ditto	Ditto. During this day and those following fourteen shocks were felt.			Ditto.

5 <sup>th</sup> P.M.	Pieve, near Perugia in the States of the Church.	Violent.....	the numbers being confounded. Many buildings damaged .....	Seyfart, p. 130.
April 22.	— 26. Santo Gemini .....	Several shocks.....	.....	Gazette de France, 23 Juin.
4 a.m.	In some parts of En-	Trembling motions	No account of this given by the English chro-	Seyfart, <i>loc. cit.</i>
middle of	gland.	for three hours.	nicles.	
month.				
t half				
our after				
light.				
3.	— 22 Civitella .....	Daily shocks in the	.....	Gazette de France, 30 Juin.
		morning and even-	.....	Seyfart, <i>loc. cit.</i>
	— 26. Perugia, Todi, Aurelia.	ing.	.....	
	S. Gemini, in the	Another rather violent	.....	
	States of the Church.	earthquake.	.....	
June 8.	Knotsford in Cheahire.	A trembling lasting	Not mentioned in the Philosophical Transac-	Ditto, p. 131.
teen 11	Especially felt in the	for twenty seconds.	tions.	
12 P.M.	villages of Tabley,			
	Tatton, Rostberra,			
	Mobberly, Toft, and			
	Peover.			
— 9.	Turin, extending also to	.....	In Switzerland several wells dried up, and did	Vassali-Bandi, Rapport, &c. as be-
	Switzerland.	.....	not reappear until after the shocks of 1755.	fore quoted, pp. 27 and 114.
— 15.	St. John in the Island of	.....		Seyfart, <i>loc. cit.</i>
	Antigua.	.....		
— 18	Cagli near Urbino.	Five shocks .....	On the same or following day a storm accom-	Ditto.
9.			panied by hail was experienced at the same	
			place.	
July ...	Naples .....	.....	.....	Kant, Géog. Phys. &c., as before,
				p. 314.
— ...	In different parts of En-	Shocks.....	.....	Ditto.
	gland.			
Sept. 26.	Riccioli in Tuscany.....	Two violent shocks.	.....	Seyfart, <i>loc. cit.</i>
— ...	In different parts of En-	More shocks .....	Accompanied by a terrible noise .....	Kant, <i>loc. cit.</i>
	gland.			
Nov. 14.	Genoa .....	Three slight trem-	.....	Seyfart, p. 132.
		blings.		
Dec. 8.	Brest in Bretagne .....	A trembling.....	.....	V. Hoff.

1.	2.	3.	4.	5.	6.
1753. ....	In Sweden .....	Tremblings .....	.....	.....	Abh. d. Akad. zu Stockholm, 1753, S. 69.
—	St. Domingo .....	.....	.....	Shocks attended with subterranean noise .....	Mém. de l'Acad. de Dijon. an. 1783, 2 <sup>e</sup> semestre, p. 37. Seyfart; Kefenstein.
1754. Jan. 12. 11 <sup>h</sup> 30 <sup>m</sup> P.M.	Vorreppe, 2 leagues from Grenoble.	Some shocks from N. to S.	.....	Accompanied by a noise like that produced by the falling of masses of rock. In a neighbouring village some houses were thrown down.	Daussy's memoir, <i>loc. cit.</i>
— Feb. 5. 5 P.M.	In 20' S. lat. and 23° 10' W. long.	.....	The vessel La Silhouette, Capt. Pintaul, felt an extraordinary shock, as if caused by touching a bank.	.....	.....
— April 19. 11 A.M.	York in England. Also felt at Foforth, Bishopthorpe, Huntington, and Hessington, 2 or 3 miles from York.	A wave-like motion, lasting for three seconds.	.....	Accompanied by a rattling noise like that of a laden waggon on a stone pavement.	A Phil. Trans. vol. xlviii. partii. p. 564.
— June 7. At night.	Rome, Tivoli, Frascati, Valmontana, in la Pa- lestrina, and la Riccia.	A violent shock .....	.....	.....	Gazette de France, 13 Juillet.
— — 12.	In the Morea, and island of Metelin. Also through a great por- tion of Central Italy and Sicily.	.....	.....	More violent in Greece than in Italy. v. Hoff gives the date 15th June.	Gazette de France, 30 Juillet; Huot, <i>loc. cit.</i> ; v. Hoff; Seyfart.
— 18. (N.S.) At night.	Rome and the neigh- bourhood.	Several shocks .....	.....	.....	Gentleman's Magazine, vol. xxiv. p. 336.
— July. Beginning of the month.	Smyrna .....	A very violent earth- quake.	.....	.....	Seyfart, p. 132.
— Aug. 18. 4 P.M.	Island of Amboina .....	Eighty-five shocks fol- lowed between Aug. 18 and Sept. 22.	.....	The earth opened in several places, and water gushed out.	Pinkerton's Collection of Voyages and Travels; Seyfart, p. 398.
— 19. (N.S.) Betw <sup>n</sup> 8 and 9 A.M.	Padua .....	One shock .....	.....	.....	Toaldo, Essai Météor. p. 270.
— 30.	Venice .....	.....	.....	.....	Genl's Mag. vol. xxiv. p. 432.

Sept. 2. 10 P.M.	Constantinople. Also At Constantinople a vertical shock followed by some horizontal oscillations, the whole occupying about thirty seconds. The direction nearly E. to W.	three or four metres above the lowest tides.	In Constantinople much damage was done to the buildings. The shock was there felt more violently in the upper than the lower stories. The city of Sivas was ruined, that of Nicomedia much injured. The earthquake was preceded by complete calms. The wind during the day on which it occurred was from E.N.E. to E.	Phil. Trans. vol. xlviii. part ii. p. 819, and vol. xlix. part i. p. 117.
— mid-t.	Constantinople .....	.....	.....	Ditto.
— 3. Ditto .....	Ditto .....	.....	.....	Ditto.
— 4. Ditto .....	Two rather more violent shocks.	.....	.....	Ditto.
— 5. Ditto .....	Two more shocks ..	.....	.....	Ditto.
— 6. Ditto .....	Ditto .....	.....	Followed in the evening at 8 o'clock by thunder, lightning, and hail.	Ditto.
— 7. Ditto .....	Ditto .....	.....	.....	Ditto.
— 8. Ditto .....	.....	.....	.....	.....
— 9. 10 A.M.	Tain in Dauphiny .....	.....	The Collection Académique gives the dates 9 and 10 November for these shocks, and the third at the same place mentioned below.	Gazette de France, 5 Oct.
— 10. 11 P.M.	Constantinople .....	.....	.....	Phil. Trans. loc. cit.
— night.	Ditto .....	.....	.....	Ditto.
— 11. 12 P.M.	Tain in Dauphiny .....	.....	Accompanied by a noise like thunder .....	Gazette de France, loc. cit.

1.	2.	3.	4.	5.	6.
1754 Sept. 11. Half an hour after mid- night.	Constantinople	Another shock			Phil. Trans. <i>loc. cit.</i>
— 12. A little before dawn.	In the neighbourhood of Brieg in the Valais to Villeneuve; and at Sion and Bex.	Slight tremblings			Bertrand; Coll. Acad.
— 13. 3 A.M.	Constantinople	Another shock		Many persons said they felt slight shocks all through the month. The first appears to have been the only very violent one.	Phil. Trans. <i>loc. cit.</i>
— 4 P.M.	Neighbourhood of Brieg, as above.	Other slight motions			Bertrand; Coll. Acad.
— 19. Between noon and 1 P.M.	Ditto	Alternate oscillations from S. to N.		The shocks were more felt in the mountains than in the plains. They were violent enough to damage the bishop's palace at Sion, and to throw down masses of rock in the government of Aigle. A noise like the discharge of nume- rous pieces of artillery was heard, coming as it were from the mountains. Unattended by any noise	Ditto.
— Oct. 6. 8 <sup>h</sup> 45 <sup>m</sup> P.M.	Constantinople	Several undulatory shocks.			Phil. Trans. <i>loc. cit.</i>
— 7. At noon.	Ditto	A slight trembling			Ditto.
— 22. — 29.	Ortaiano near Vesuvius. Naples and towards Mas- sa-di-Somma.	A rather violent shock A considerable trem- bling.		Vesuvius opened on the 25th, but there was no serious eruption until the 2nd December.	Dulae, Mém. d'Hist. Nat. t. iv. p. 392. Ditto.
— Nov. 4. 10 <sup>h</sup> 19 <sup>m</sup> P.M.	Constantinople	A shock which lasted but a short time.			Phil. Trans. <i>loc. cit.</i>
— 19. 9 <sup>h</sup> 45 <sup>m</sup> P.M.	Ditto	Another quite percep- tible shock.		v. Hoff calls attention to the fact that this earth- quake, though the shocks continued so long, seems to have produced no atmospheric dis- turbance, the strength and direction of the wind, and height of the barometer continuing pretty constant throughout the whole period. Accompanied by a slight eruption of Hecla	Ditto. v. Hoff.
— 1755. Jan. 12. 7 P.M.	On the north side of Hecla in Iceland. Hermanstadt	One shock			Gazette de France, 8 Mars.

P.M. — 23. 1 <sup>st</sup> A.M.	Ditto	Another shock	.....	.....	All the dates of these shocks at Constantinople are according to <i>Old</i> style. The Gazette de France mentions other shocks on the 14th September, 1754, the 26th September to 2nd October, and the 4th October. These seem doubtful.	Ditto.
Feb. 25.	The island of Metellino in the Archipelago.	A trembling felt during this month.	.....	.....	In March Etna was in eruption	Kefenstein.
Apr. 27. 1 A.M.	Ditto	A violent trembling motion.	.....	.....	A subterranean noise heard, unaccompanied however by any sensible shock. This noise recurred on the two following days.	Kant, <i>loc. cit.</i> p. 314.
— 27. 1 A.M.	Ditto	A violent trembling motion.	.....	.....	Large masses of rock were thrown down from the hills, completely shivered into small pieces, and thrown to a great distance. The surface of the ground also was much disturbed, elevations and depressions being formed.	Ditto.
— ..	In Hertfordshire	.....	.....	.....	No distinct shock mentioned. The hills were shaken, and masses thrown down.	Collection Académique.
About April 7.	In Bretagne	Very sensible shocks	.....	.....	Ditto.	Ditto.
— 28.	On the coast of Bothnia	A violent shock	.....	.....	.....	Gazette de France, 24 Mai. Edinburgh Encyclopedia, Article Chronology.
— ..	Stepney in Middlesex. Also in Brabant, and at several places along the coast of the Mediterranean.	Shocks were felt at all these places during the month.	.....	.....	.....	Kefenstein.
May 17.	At Viterbo in Italy	Three violent shocks.	.....	.....	The shocks were so violent that processions were formed the same night in order to avert their continuance.	Gazette de France, 4 Juin.
June 7.	In northern Persia (Iraq), at Tabriz, Kaschan, Hann, Isphahan, and Tauris.	Very violent shocks.	.....	.....	In Kaschan more than 600 houses were thrown down. Altogether 40,000 persons perished.	Gazette de France, 8 Nov.; Journ. Hist. Dec. p. 462; Seyfert; Ker Porter's Travels.
Aug. 1.	Stamford in Northamptonshire.	One shock	.....	.....	.....	v. Hoff.

1.	2.	3.	4.	5.	6.
1755, Aug. 24. 3 A.M.	Orgaz and Mora in the district of Toledo, Spain. More violent at the latter place.	Several shocks		Accompanied by a noise like thunder	Collection Académique.
— Sept. 2. 5 A.M.	Rome and the neighbourhood.	A slight earthquake			Seyfart, p. 140.
— 10. At night.	Nord-Syssel. (Perry says this is in Denmark. Should it not be Iceland?)	A violent shock			Gazette de France, 10 Janv. 1756; Journ. Hist. Fév. 1756.
— 11.	Ditto	Several more shocks.		The shock at 2 P.M. threw down several buildings. All the following day the water of a little river near was white like milk.	Ditto.
— And during all the remainder of the month.	In various places in Iceland.			Keferstein says from the 5th to the 27th September.	Hoff.
— Oct. 4. Between 10 and 11 A.M.	Orgaz and the neighbourhood.	Slight shocks			Collection Académique.
— 4 P.M.	Mora in the same district of Toledo.	Another shock.		A great number of strange meteorological phenomena are recorded as having been observed during this month in Spain. Indeed, for some time before the great earthquake of Lisbon, the accounts of halos round the sun and moon, igneous meteors, alterations in well and river water, which generally acquired an offensive odour, besides thunder, lightning, and ruin, are to be found from almost all parts of Europe. These phenomena were most remarkable in Spain, where the water in many of the wells was quite troubled, and rats and some species of reptiles came forth as if much terrified. Domestic animals also appeared frightened and uneasy.	Ditto.
— First half month.	In Lake Ontario in N. America.		No shock is mentioned, but the water repeatedly rose in an unusual way to the height of five feet.		Phil. Trans. vol. xlix. pt. 2. p. 544.

17.	at Chiambery. Myrdalen in Iceland	from N.E. to S.W. A violent earthquake. Many other shocks were felt during the month.			sounded in the third story. On the 19th Katlegias burst into eruption, v. Hoff: Gazette de France, 3 Janv. 1756; Journ. Hist. Fér. 1756. which continued until August 1756.
Nov. 1.	THE GREAT EARTHQUAKE OF LISBON.	This earthquake, one of the most violent and widely extended on record, produced sensible effects over a space of the earth's surface included between Iceland on the north, Mogador in Morocco on the south, Toplitz in Bohemia on the east, and the West India islands on the west. Actual shocks however were not felt over the whole of this surface; in some places agitation of the water in lakes, canals, &c. being the only sensible effect produced. The centre of disturbance seems to have been situated beneath the Atlantic Ocean a little west of the coast of Portugal. In Portugal itself, and especially in Lisbon, the most terrible destruction took place, partly owing of course to its contiguity to the seat of volcanic action, and partly to the nature of the earth's surface at that place. In order to arrange all the voluminous notices of this earthquake from so many places, they are here taken merely geographically, the times being given just as recorded, without correcting them for longitude.			
Betw <sup>n</sup> 9 <sup>h</sup> 30 <sup>m</sup> and 9 <sup>h</sup> 40 <sup>m</sup> A.M.	Throughout Portugal about the same time.	The shocks appear to have been from W. to E. The first shock was slight and lasted about one minute (v. Hoff says 6 secs.). The houses in Lisbon were however sensibly shaken by it. Half a minute afterwards, another shock took place much more violent than the former, which lasted eight or ten minutes (?), and two minutes afterwards the third and most violent shock, which appeared to consist of alternate movements in diametrically opposite directions. This was followed by several other much lighter shocks.			
9 <sup>h</sup> 30 <sup>m</sup> 9 <sup>h</sup> 40 <sup>m</sup>	Oporto and Colares. Lisbon	The sea came in three times to an extraordinary height (according to some 15, to others 40 feet higher than usual (high tides); each wave succeeding a shock. It continued ebbing and flowing in great agitation the whole day, and next night the whole of the new quay at Lisbon sank into 100 fathom of water. The waters of the Tagus, the Guadiana, the Douro, and the Minho rose high above their ordinary level, and inundated the country.			
		The town of Compostella also suffered but little. Most of the towns and villages of Portugal experienced more or less damage. The mountains of Estrella, Arrabida, Marvao, and Monte Junio, were much shaken. Clefs opened in the earth in some places. Near Colares the sea bottom between the land and some rocks in the sea, rose so much as to make the place impassable for small vessels, which it had not been before. In another place also rising of the land was observed.			
	In Spain the earthquake.	The sea rose at Gibraltar.			
		At Gibraltar a violent			
		Seville, St. Lucar, and Xeres were greatly injured.			



1.	2.	3.	4.	5.	6.
10 <sup>h</sup> 10 <sup>m</sup> .....	was very violent at Gibraltar. The shock was strongly felt at Cadiz. At Madrid the shock was not quite so great. At Grenada, at the Escorial, at Cordova, at Seville, and throughout all the rest of Spain, with the exception of Barcelona and all Catalonia, as also certain districts in the kingdoms of Valencia and Arragon, the shocks were felt with more or less violence.	trembling for 23 (or 30) secs., and then a weaker lasting three minutes with wave-like oscillations. At Cadiz the shock lasted three minutes with violence, and continued, though decreasing, for six or seven minutes. At Madrid two slight shocks were first felt, and then several violent ones. Their direction appeared to be from S. to N., and they lasted altogether five minutes. At Cordova the motion lasted nine minutes with violence; the second shock lasted 24 secs. At Seville they lasted eight minutes.	tar 7 feet higher than usual, and a quarter of an hour after fell extraordinarily low. This ebbing and flowing lasted from one quarter of an hour to another, but constantly becoming weaker, until the following morning. At Cadiz the sea came in with overwhelming violence at 11 <sup>h</sup> 10 <sup>m</sup> , inundating the town, and causing considerable loss of life. It tore away the rampart for 100 toises in length. The sea came in again at 11 <sup>h</sup> 30 <sup>m</sup> —11 <sup>h</sup> 50 <sup>m</sup> —12 <sup>h</sup> 30 <sup>m</sup> —1 <sup>h</sup> 10 <sup>m</sup> —1 <sup>h</sup> 50 <sup>m</sup> ; constantly decreasing in force.	Conil was completely destroyed. The town of Compostella in Galicia suffered but little. At Cadiz only three or four old houses were thrown down. At Madrid the water in the wells rose several fathoms a little after the shocks. The houses there were much shaken, but nothing fell but two crosses from the summits of the churches. A cleft opened in one place in a mountain, from which an exhalation destructive to cattle issued. Rota, Malaga, Chiclana, Medina, &c. were more or less injured. Birds and quadrupeds exhibited decided symptoms of fear. Numerous meteors and other unusual atmospheric phenomena are stated to have been observed about this time in Spain and Portugal.	
About 10 <sup>h</sup> ...	In Africa the northern portion experienced the shock with nearly as much force as Portugal. At Ceuta the shocks continued for some days. At Algiers also they were very violent.	At Tetuan three shocks were felt in seven or eight minutes. In Tangier they lasted longer. At Ceuta the first shock lasted about 30 secs. It was followed by slighter ones for three minutes.	At Tangier the sea ebbed and flowed eighteen times (some said to a height of 50 feet) before 6 p.m., and the wells for half a league from the coast were dry until evening. At Safé the sea inundated the town. At Ceuta and Oran similar phenomena took place.	At Tetuan the water of the river Chico was coloured red. In Fez houses and part of a neighbouring hill were thrown down. Water was also coloured red here, probably by ochreous mud. At Salle many houses fell. So also at Mequinez, Safé, and Morocco. Near the latter place a mountain opened, and swallowed up a village with 8000 or 10,000 people. Opposite the port of Mogador, some rocks sank suddenly, so that the water, before shallow, became twenty fathoms deep. At Ceuta the points of a mountain appeared to rise and fall.	
10 <sup>h</sup> 10 <sup>m</sup> .....					

<p>The south and west of France experienced these shocks, and even in Pottou, Bretagne, and Normandy they were felt. At Caen they were violent.</p>	<p>At Bordeaux there was but a slight trembling for some minutes.</p>	<p>The water of the Garonne was greatly agitated at Bordeaux.</p>	<p>Toulouse, Anduze in Languedoc, Angoulême, Cognac en Saintonge, and Bordeaux are mentioned as places where the shock was felt. The waters appeared to boil, and changed colour. This was also observed in Provence, at Cuers, Vauluse, Gémenox, and St. Auban. At Angoulême subterranean noises were heard, and a cleft opened in the earth.</p>
<p>In <i>Switzerland</i> some shocks were felt in the Valais, especially at Brieg and the neighbourhood. Also near Visp (Viège). The neighbourhood of Neuchâtel, as indeed almost all Switzerland, was more or less shaken.</p>	<p>The shocks here do not seem to have been so distinct as further west, but that the earth was sensibly shaken there can be no doubt. Between 3 and 4 p.m. shocks were felt at Bale, and during the night two shocks at Locle.</p>	<p>Between 9 and 10 the Lake of Geneva retired three times from its eastern shore, while at the western nothing unusual was perceived. A vessel upon it appeared struck suddenly. Very many wells in different places were troubled and rose to unusual heights. The lakes of Thun, Brienz, Neuchâtel, Evalliere, Constance, and Zurich, were also disturbed. The last rose from 6 to 10 and up to 12 feet. The course of the river Aar appeared for a moment retarded. A sulphurous and bituminous well near Kilchberg flowed in greater quantity than usual, and was troubled. The Rhine near Constance appeared to stop and rise for some moments.</p>	<p>In the subterranean mill near Locle, which lies nearly 300 feet deep, a terrific underground noise was heard. At the lake of Zurich a low noise was heard, as also at the little lake of Seedorf, where the noise appeared not merely in the air, but under the water. The <i>maximum</i> height of the barometer at Berne for this day was 26 in. 11 lines; the <i>minimum</i> at the same place was 25 in. 5 lines. At Bale it was as low as 26 in. 2 lines, the mean being 27 in. The thermometer at Berne was at 6 a.m. 2°·5 below zero of Reaumur; towards evening it rose to 2° above zero.</p>
<p>10<sup>h</sup> ...</p>	<p>10<sup>h</sup> ...</p>	<p>On the lake at Salzmünster.</p>	<p>At Augsburg magnets let the weights suspended</p>

1.	2.	3.	4.	5.	6.
<p>were felt in many places in Swabia, as at Cannstadt, Augsburg, and Donauwörth. At Toplitz in Bohemia a smart shock.</p>	<p>very violent in Central Europe, the effects of the earthquake being principally manifested on the lakes and other pieces of water.</p>	<p>gen at the S.W. extremity of the Thuringer Wald, extraordinary movements were observed, during the night preceding the earthquake (v. Hoff thinks this account doubtful). In the lakes of Templin, Netza, Mühlgest, Roddelein, and Libe-see, and those of the Markgraviate of Brandenburg disturbances were also observed. So also at the lakes of Salzburg, and the Walchensee. The Elbe was agitated at Hamburg at 1 p.m., at Glückstadt between 11 and 12 noon.</p>	<p>At Milan the lamps swung of their own accord in the churches, the water was thrown out from the canals upon the bunks, and vessels full of liquid flowed over. At Abbiategrasso the doors and windows opened and shut with violence, and the water of a canal returned towards its source, and then resumed its course with impetuosity. The smoke which had been coming from Vesuvius for some time before, at the moment of the earthquake, sank back into the crater, and disappeared.</p>	<p>At the Hague and Rotterdam bodies which were suspended were seen to oscillate. The canals were affected far inland.</p>	
<p>11<sup>h</sup> 30<sup>m</sup> (Milan time). Milan in Italy was slightly shaken. At Abbiategrasso 8 leagues N.N.W. of Turin the shock was also slightly felt. Central and Southern Italy experienced nothing.</p>	<p>The actual shocks were slight, and are only mentioned as having been felt at these two places.</p>	<p>The waters of the Lago Maggiore rose and sank suddenly.</p>	<p>At the Hague the water was seen suddenly agitated in a remarkable manner, the air</p>		

<p>Tremblings were felt in <i>Denmark</i> at Ransburg, Elmsborn, Bramstedt, Kellinghausen, and Meldorf.</p>	<p>Several shocks were felt at these places.</p>	<p>being quite calm. This occurred simultaneously at the Hague, Leyden, Harlem, Amsterdam, Gouda, Utrecht, Rotterdam, and Boisselle. The motion appears to have been least violent at the Hague. According to one account this took place at 11 o'clock. Another letter mentions 10½ and 11, as if it occurred twice. All along the coasts of Holland and Friesland the sea was much agitated. Vessels were dashed together by it, and moorings broken. In this country the waters appeared to boil in many places. They were also agitated and a bellowing noise heard at Alingsås, Wenersborg, on the lake of Mjörn near Gottenburg, and in some rivers, especially the Eider and Sturh.</p>	<p>The wells and springs rose so as nearly to inundate the land in some places.</p>
<p>In <i>Sweden and Norway</i> this earthquake was distinctly perceived. In 4 A.M. (This must either be a mistake as to time, or the shock must have been felt, on the authority of</p>	<p>At Christmas and the shock was felt at a ship 17 miles south of Cape Lindesnes, everything appearing calm again in a few</p>	<p>At Christiansand a noise was heard like that of a great wave, and then a shock felt which shook the furniture of the houses. In Gothenburg large trees were uprooted and thrown down. At the lakes of Frixem and Stora Leed the earth sank suddenly and then rose again</p>	

2.	3.	4.	5.	6.
<p>the Collection Académique. v. Hoff thinks the accounts from both these places doubtful.</p>	<p>a different one from that at Lisbon.) In Iceland, according to the Collection Académique, the shocks continued for three days in the district of Myrdahl.</p>	<p>minutes. The lake of Dybeyond, 3 miles from Christiansand, was swollen with a loud noise, and undated its banks. The lake Tarevand did so likewise, and threw out wood which had been imbedded in its bottom. The lake Orevand, the waters at Skie and Laurvig in Tellemarken, and the lake Femundsøe were much agitated. The lake Wener, and those near Gothenburg, in Dalecarlia and Werneland, suffered similar disturbances. At the lakes of Frixem and Stora Leed the water rose suddenly.</p>	<p>with a loud noise. In Iceland many houses are said to have been thrown down. The volcano of Katlegaa was in violent eruption at the time.</p>	
<p>In the <i>British Isles</i> actually sensible shocks were felt in but few places, the earthquake being principally remarkable from its effects upon the sea round the coast, the lakes, and ponds. Only four places are mentioned as localities where the earth actually shook, viz. Cork in Ireland, Eyam-Edge</p>	<p>At Cork a strong shock was felt at the time mentioned. At Eyam-Edge four violent shocks were felt in a space of 20 minutes. Near Reading the earth shook for 50 seconds. At Caversham it lasted 1 minute.</p>	<p>At Cork the sea was much agitated. At 10 o'clock, the sea rose 12 to 18 inches at various places on the Frith of Forth, in the neighbourhood of Leith in three or four minutes. At Yarmouth the sea rose to the height of 6 feet a little before noon. At Gainsbo-</p>	<p>At Eyam-Edge the shocks were felt in the Derbyshire mines at a depth of 60 fathoms, and at the surface. They were accompanied by a loud noise in the interior of the earth. Pieces of rock were detached and fell in the galleries of the mines. Some days after a long fissure was observed in the ground in this locality. The waters of a pond near Reading appeared to boil, and were raised over their banks to the extent of 20 inches above their usual level. At Caversham a noise was heard as if the house were falling, and a vine trained against the building was broken. Two trees also were</p>	

9 A.M.  
About 11.



in Derbyshire, a place near Reading in Berkshire, and Caversham in Oxfordshire, one mile from Reading. At Cranbrook in Kent also some people *believed* that they felt the earth tremble.

rough it attained the same height and recovers its level in 1 or 2 minutes. The same thing was observed at the same time at Hull. At Hunston several people were in great danger from the rapidity of the motion of the water. At 10<sup>h</sup> 35<sup>m</sup> at Portsmouth the agitation of the sea was so great that 70 and 86 gun-ships rolled to the extent of 3 feet. The water rose, after 9 o'clock at Dartmouth, above the level of the highest tides, and retained this height for three-quarters of an hour. At Plymouth about 4 P.M. (the time of high water) the sea retired and then came back in 8 minutes, in each case to the extent of 6 feet. The ebbing and flowing continued for some time. At Mount's Bay the flux and reflux, which began about 2 P.M., was very violent and of about the same height. It lasted five hours. At Penzance

injured. At Cranbrook in Kent the water in some fish-ponds rose upon one bank, then retired, and rose on the opposite bank. At Busbridge, near Godalming in Surrey, at 10<sup>h</sup> 30<sup>m</sup>, the water rose 20 inches above its former level in a canal (running from W. to E.) of 700 feet long by 58 feet wide and 3 to 10 feet deep. The fluctuations lasted about a quarter of an hour, and were attended by a loud noise, sand also being thrown up in great quantity from the bottom. The channel which fed this canal rose towards its source, leaving 36 feet of ground dry. At Lee in the parish of Whitley, at Cobham near Guildford (where at 10 o'clock oscillations of the water from S. to N. and then from N. to S. were very distinct), at Medhurst in Sussex, at Tunbridge Town and Eaton Bridge, two places near Chevening in Kent, in the Thames at Rotherhithe (at between 11 and 12), near London at Peerless Pool (between 10 and 11), at Rochford in Essex (at the same time as the shock at Lisbon), at Earley Court near Reading, at Shireburn Castle in Oxfordshire, at four places in Hertfordshire, near Durham, on Windermere and others of the Cumberland lakes, on Lochs Lomond, Ness, Long, and Katrine in Scotland, and other pieces of water throughout the two kingdoms, similar phenomena were observed. See the more minute account of them in the Philosophical Transactions.

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<p>9½ A.M. (Funchal time = about 10 A.M. Lisbon time).</p>	<p>Over the surface of the <i>Atlantic Ocean</i> the disturbance seems to have extended widely, as far as the necessarily limited observations go. At Funchal in the south of Madeira, the shock was strongly felt.</p>	<p>At Funchal the shock was violent, from E. to W., and consisted of two epochs of undulation, the first being much the more violent. The whole lasted 1 minute.</p>	<p>it began at 2<sup>h</sup> 45<sup>m</sup>, lasted but 3 hours, and attained the height of 8 feet. At Newlyn and Mousehole, on the same coast, the phenomena were almost identical. This strange tide was also remarked at St. Ives, Hayle, and Swansea, at the last place about 6<sup>h</sup> 45<sup>m</sup>. At Kinsale in Ireland the water came over the quay with such violence as to throw many people down. At 9½ 45<sup>m</sup> a Dutch vessel, a league and a half off Monte Zizambre (6 or 7 leagues from Setuval) experienced a violent shock. Some more shocks were felt on board the same vessel towards sunset. v. Hoff mentions the shock as felt by a ship 30 leagues west of Lisbon. Several other vessels appear to have experienced it in various regions of the Atlantic. At 11<sup>h</sup> 45<sup>m</sup> at the island of Madeira the sea suddenly retired</p>	<p>The crew of the Dutch vessel mentioned saw the effect of the shock on Monte Zizambre itself, large masses of rock being detached and rolled into the sea. Towards night a mass of smoke (observed also at Colares) was seen in the E.N.E., 7 or 8 leagues from where they were, and afterwards a fire, the light of which was seen all night. (This probably proceeded from one of the towns ruined and on fire.) At Funchal the shock was preceded by a dull noise like that of carriages, which lasted some seconds after the shocks. The doors and windows vibrated quickly.</p>	

(though the weather was perfectly calm) to the extent of 100 paces, and then as suddenly returned to the height of 15 feet above the highest rides, inundating Funchal, and doing a great deal of damage on the north and east coast of the island, on the west scarcely anything being perceived. This ebbing and flowing occurred four or five times more, to a less height each time.

On the coasts of Antigua, Barbadoes, Martinique, and Saba, about 3 p.m. (true time there, = about 7 p.m. Lisbon time), the waters of the Atlantic were much disturbed. At Martinique the water rose like a wave to the upper stories of the houses, and in ebbing again left an English mile of ground dry. At Barbadoes it rose 5 or 6 feet, and ebbcd and flowed every 5 minutes for three hours, the water being as black as ink (probably from mud).

Less than ten hours after the earthquake in Lisbon, its effects were remarked in the *West Indies* by the motion of the waters of the ocean. v. Humboldt (Voyage, t. v. p. 12) says that the shock was *felt* at Martinique.



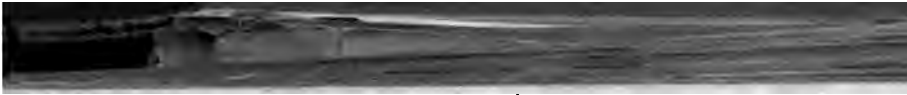
1.	2.	3.	4.	5.	6.
1755. Nov. 2.	Lisbon. Also on the same day at Bâle.	The shocks of the day before continued at Lisbon. One shock felt at Bâle.	The movement recurred 64 times from 2 to 10 p.m. The Tagus became dry for some time.		Authors quoted above for the Lisbon earthquake. For that at Bâle, a communication from M. Ch. Mar-tius to M. Perrey (see the memoir of the latter on earthquakes in the basin of the Rhine). Phil. Trans.; Coll. Acad. &c. &c., as above.
— 3.	At Lisbon again .....	At Lisbon the shocks continued.			
7 A.M. ....	At Gibraltar .....	At Gibraltar a rather violent shock of from 5 to 6 secs.			
Ditto .....	At Ceuta in Africa.	At Ceuta ditto; lasted a very short time.			
— — —	In the island of Sumatra, at Manna, fifty English miles south of Port Marlborough.	A violent shock on this day, followed by twelve others between this and the 3rd December. Still later (mentioned in a letter dated 12th January 1758, but the time not given more accurately) many more shocks. Lasted five or six minutes at the Escorial. It was more violent at Madrid, and most of all in Andalusia. At Gibraltar the shock at 2 p.m. was slight. The shocks were feeble at Lisbon.		The shocks mentioned as occurring later than the 3rd December injured Cumberland House, Salop House, Layo, and Manna. Near the mouth of the river at Bencoolen the earth opened, and threw out sulphurous water. Poble Point and many villages around Manna were destroyed.	Phil. Trans. vol. i. pt. 2. p. 491.
— 4.	Madrid, the Escorial, in Andalusia, and almost the whole of Spain, Catalonia excepted.				
10 <sup>h</sup> 30 <sup>m</sup> A.M.					
2 P.M. ....	At Gibraltar.				Collection Académique.
— 5.	Gibraltar. The shocks also continued on this	At Gibraltar this shock was more violent	At 11 p.m. of this day the sea rose a yard	From the 6th to the 16th the shocks were almost insensible about Gibraltar.	Ditto.

Nov. 7. Clermont in Auvergne and the neighbourhood.	Two rather smart shocks.	On this day a shock is said to have been felt at sea, 60 leagues from the coast of Portugal, as great as that of the 1st.	At Lisbon some houses which had resisted the former shocks were thrown down. At Seville also the cathedral was shaken, and some other buildings injured. From the 8th to the 16th no shocks are mentioned as felt at Lisbon.	Ditto.
8. A.M. The same day at Seville.	At Lisbon the shock lasted but a short time. There and at Seville the shock was violent.			Ditto; Phil. Trans.; Journ. Hist. &c. &c.
14. Brieg in the Valais	A trembling lasting one minute.		An opening appeared in a mountain near, from which water came out in large quantity.	Phil. Trans. vol. xlix. p. 511.
16. Lisbon	Renewed disturbance.	The sea rose prodigiously.	The earth seemed to rise and fall like a ship thrown down.	Collection Académique, p. 632.
17. At Gibraltar	At Irton in Cumberland violent shocks.		In Herefordshire houses are said to have been thrown down.	Coll. Acad.; v. Hoff.
even. At Whitehaven in Cumberland. Also on this day at Irton in Cumberland, and in Herefordshire.				
18. In New England, especially in the provinces of Massachusetts and New Hampshire. It was lighter towards the S.W. and N.E., and was felt in New York, Philadelphia, Chesapeake Bay in Maryland, at Annapolis Royal, in New Scotland, at Halifax, at Lake St. George to the west. Its total extent	Two violent undulatory shocks, of which the second was the slightest, followed rapidly upon each other. A tree of 30 feet high bent 10 feet from its former position. Immediately after came another and more violent shock with redoubled noise, consisting of a quick trembling motion.	A ship in the Atlantic Ocean 70 leagues east of Cape Anne experienced this remarkable ebbing and flowing of the sea at St. Martin's Harbour in the West Indies was supposed to be connected with this disturbance. The water was much agitated	Preceded by about a minute by explosions like distant thunder. At Boston the windows and furniture were much agitated. About 100 chimneys were thrown down. An eruption was reported to have taken place at Scituate 20 or 30 miles south of Boston. At Annapolis some chimneys were also thrown down.	Phil. Trans. vol. xlix. pp. 439-443; vol. l. pp. 1-18; Coll. Acad. p. 634; Gazette de France; Journ. Hist.; Mercure de France.

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	sion seems to have been about 800 miles from N.E. to S.W., by 550 from E. to W., the centre being in 43° N. lat.	tion gradually decreasing for two min. (The whole three lasted four min.) At 5 <sup>h</sup> 29 <sup>m</sup> another slight trembling was felt. The direction of the motion was from N.W. to S.E. (At New York W. to E.)	in the harbours of North America, and quantities of dead fish were observed.		
1755, Nov. 18. In the morning.	At Fez and Mequinez in Morocco.	At Fez and Mequinez the shocks were very violent, and continued until the following day.			Phil. Trans. vol. xlix. pp. 421 and 429; Coll. Acad. p. 634.
Hour not mentioned.	At Lisbon. Also at Aquapendente and della Grotta near Rome; 8th. At Aquapendente and on the borders of the Rhine and in the shock. Along the Rhine slight shocks. At Glosom also in Herefordshire. At Aix they were also and at Aix in Savoy. Tangier and Tetuan on the North coast of Africa.	At Lisbon shocks equal to those of the Grotta near Rome; 8th. At Aquapendente and on the borders of the Rhine and in the shock. Along the Rhine slight shocks. At Aix they were also and at Aix in Savoy. Tangier and Tetuan on the North coast of Africa.		At Lisbon twenty-two shocks were counted from the 1st to the 18th.	Ditto; Gazette de France; v. Hoff.
About 10 P.M.	Gibraltar	Violent shocks for four minutes.		Both places were much injured	Phil. Trans. loc. cit.
10 <sup>h</sup> 30 <sup>m</sup> A.M. Hour not given.	Mequinez in Morocco. Along the Rhine, in the Brigau, and at Aix in Savoy the slight shocks continued. Tangier and Tetuan	A very strong shock Exceedingly violent		Accompanied by a tempest. But little damage done. Mequinez was completely ruined with two Arab encampments of 25,000 or 30,000 persons.	Ditto, and the Coll. Acad. and other authorities quoted above.
2 A.M.		More shocks. They recurred several times during the day, especially at 5 and 9 A.M., and at noon, but feebler than before.			Ditto.

ov. 21. Colares near Lisbon	Two shocks			Phil. Trans. vol. xlix. p. 413.
— 22. Boston in New England	Another shock			Silliman's Journal, vol. xl. p. 206.
— 23. Colares again	Five shocks felt in the time mentioned.		On the 24th the same meteorological indications were observed as on the 31st of October, the day before the great earthquake.	Phil. Trans. &c. as before.
— 24. Sédan, Mézières, Charleville, Liège, and many other localities in Belgium.	Several slight shocks.			Ditto.
— 25. Cordova, and apparently all along the south coast of Spain.				Ditto.
— 26. At Malaga		About this time unusual movements of the waters of the ocean were still observed.	tion Cordova as shaken on that day. During the whole of this, and indeed the next month, slight shocks appear to have occurred almost daily in Spain, Portugal, Switzerland, and on the North coast of Africa.	Ditto.
Dec. 9. At Lisbon	The most violent shock which had been felt at Lisbon since the 1st of November.		Though the hour of this earthquake is not given, it was in all probability close to that at which the one in Switzerland, &c. took place.	Ditto.
— Throughout Switzerland and parts of France, Bavaria, Swabia, the Tyrol, the Italian Alps, and even north of Bavaria. Amongst the places where this earthquake was felt were Turin, Milan, through Piedmont, and Savoy, and as far as Naples, Brieg in the Valsais, throughout the whole chain of the Alps and of Jura, at Chiavenna,	At Turin one shock lasting from 4 to 6 seconds, in the direction S. to N., and some minutes after a slighter shake of 2 seconds' duration in the same direction. At Brieg at 2 o'clock a subterranean explosion was heard, and soon after slight movements were perceived, at 2½ stronger, and at 2½	Many of the small lakes of Switzerland were agitated, though not nearly so much as on the 1st of November. The Rhine also was ruffled as by a moderate wind. The lakes, rivers, and springs were most unusually full and swollen, so that terrible inundations were the consequence in several	At Milan the water came in larger quantity than usual from the wells. Some damage was also done to buildings. At Brieg and throughout the Valsais chimneys were thrown down, and all the buildings much shaken. The arches of some churches fell. The earth too opened here in many places in the direction S. to N. (that of the shock); some of these fissures threw out water to the distance of several feet, and others closed again themselves. Springs also dried up. Brieg, Glisa, and Natria were much injured. On a mountain, 2½ miles from Brieg, the earth sank 1 inch daily from this date till the 26th February 1756. From the 9th until the 21st December slight shocks were	Ditto.

1.	2.	3.	4.	5.	6.
<p>2<sup>h</sup> 39<sup>m</sup> 2<sup>h</sup> 32<sup>m</sup> 2<sup>h</sup> 45<sup>m</sup> 2<sup>h</sup> 45<sup>m</sup></p>	<p>at Aigle, on the banks of the lake of Geneva, in the Cantons of Fribourg, Berne, Lucerne, Aarau, Zug, Zurich, Schwyz, Glarus, Appenzel, Thurgau, Schaffhausen, Basel, Neuchâtel, and in France Comté. Also at Mulhouse, Besançon, Bourg, and in the Lyons, in the Tyrol, and at Munich, Ingolstadt, Donauwörth, Augsburg and Næstembach.</p>	<p>a very violent earthquake, which was felt all through the Valais. These shocks recurred at intervals of half an hour, but with diminished intensity. Three principal shocks were everywhere felt. At Berne these lasted altogether one-third or half a minute. At Lucerne a slight shock had been felt at 1<sup>h</sup> 30<sup>m</sup> p.m., and at Næstembach one at 8 a.m., followed by a second at 10 a.m., also felt at Donau-Eschingen. The violence of the shocks is reported very variously, even different people in the same room perceiving them differently.</p>	<p>provinces of France.</p>	<p>felt daily, always preceded by a little trembling some time before, the wind falling at the same time. At Vevey, Morges, Lausanne, and Nyon the shocks were violent. At Vevey they were most so in the streets running along the lake. The same was true at Geneva. The shocks were scarcely at all felt on elevated points. At almost all places they were accompanied by a loud noise. It was said that the Aar was covered in some places by a thick vapour and appeared to boil, a moment before the shocks. All through Switzerland bells were made to sound, doors and windows moved, and buildings were cracked and injured. At Chiavenna rocks were detached from the hills. At Zurich the people believed that they smelt an odour like sulphur after the shocks. Ice was cracked in some places. At Berne the barometer was at 27 in 7 lines, and at Bâle at 27 in 44 lines. At Morat a magnetic needle moved 0° 25' to the west, about the moment of the shock. At Hohen Emis, a magnet suspended by a cord of 11 inches long swung more than 40° from the vertical (!).</p>	<p>Phil. Trans. &amp;c. as before.</p>
<p>1755. Dec. 10.</p>	<p>Brieg in the Valais .....</p>	<p>More shocks. They recurred daily, though with decreasing violence, up to the 21st. Several shocks. At Lisbon they were nearly as violent as those of the 8th and 18th November. At Ingolstadt another shock.</p>			
<p>— — — 11.</p>	<p>Lisbon, Colares, Madrid, and Orleans in Spain and Portugal. At Brieg also the shocks recurred; and in the Electorate of Ingolstadt in Bavaria.</p>				<p>Ditto; Gazette de France, 10 Janv. 1756.</p>



*Third Report on the Facts of Earthquake Phenomena (continued).*

*By* ROBERT MALLET, C.E., M.R.I.A.

*Catalogue of recorded Earthquakes from 1606 B.C. to A.D. 1850.*

[Continued from Report for 1852, p. 176.]

1. ANNO DOMINI.	2. Locality.	3. Direction, duration, and number of shocks.	4. Phenomena connected with the sea.	5. Meteorological and other phenomena.	6. Authority.
Dec. 13. Between 12 and 3 P.M.	Strasbourg, Huningen, Bourg en Bresse, Dijon, Flavigny, Monthard, and many places in Franche Comté.	Slight tremblings			Coll. Acad.; Journ. Hist.
— 15.	Brieg	Ditto			Phil. Trans.; Coll. Acad. Collection Académique.
— 17.	In the Aargau, and still at Brieg.	Ditto			Gazette de France, 10 Janv.; Journ. Hist. Fév. 1756, p. 134.
— 18.	The village of Glonsow, near the Wye in Herefordshire.	A violent shock		Accompanied by a frightful subterranean noise. About 500 yards from the village a piece of land of two acres in extent sank down. The hills near had been shaken in the month of March preceding. This account is obviously confounded with that of the 18th November. The latter appears likely to be the correct one.	Collection Académique.
— 19.	The same region of N. America which had been shaken on the 18th and 22nd November.	Renewed tremblings			Philosophical Transactions, <i>loc. cit.</i>
— 20.	Brieg in the Valais. Also the village of Locle.	Another shock particularly cullarized			

Dec. 21. Brieg again, and the whole country round, the 21st to the 27th A.M. Also at Lisbon and the country round, with the kingdom of Algarbia.	Rather violent. From the 21st to the 27th were felt daily at Brieg, but at various hours. At Lisbon the disturbance was again violent.	.....	Some stones and tiles fell from the houses. In Portugal fresh disasters were produced by the shocks of this day. More than 300 persons perished under the ruins of houses which were thrown down, or in the waters of the Tagus, which overflowed its banks. A league of country was submerged by the sea in Algarbia. The extremity of Cape de la Bagne was carried away. The towns on the frontiers of Spain suffered least.	In Ditto; Coll. Acad., &c.
— 23. In the mountains of Roussillon.	A trembling.	.....	v. Hoff quotes Kant.	v. Hoff quotes Kant.
— 24. At Besançon, Lyons, and Geneva.	Sensible shocks	.....	v. Hoff give the 23rd as date.	Coll. Acad.; Journ. Hist.
— 25. Milan and in the Maritime of Ancona.	Two strong shocks	.....	Great damage done. A thousand victims perished	Huot, <i>loc. cit.</i> ; Gazette de France, 20 Fév. 1756; Journ. Hist. Avril, 1756, p. 304.
Also at Lisbon	Shocks a little more violent than those which were constantly occurring, but have not been particularized. Slight shocks were felt almost every day from this up to the 6th January.	.....	The Collection Académique gives the dates 27th and 29th December for the events here mentioned (on the authority of Perrey) on the 27th and 29th November.	Coll. Acad.; Gazette de France; Journ. Hist.
— 26. Maestricht and Cologne.	A slight shock followed by another more violent at 4½ P.M.	.....	.....	Ditto; Phil. Trans. &c.
u. and In the district of the Lower Rhine, especially at Brussels, Liège, Maestricht, Nimeguen, and even as far as Arnheim and Breda. Also in Cologne, Bonn, some valleys of Ahrace and Lorraine, in Picardy, and in the Alps.	Two shocks, at the hours mentioned. Both were undulating. At Rocroy a shock was felt at 11½ 56".	.....	In the Alps some wells became salt. v. Hoff appears to have confounded those mentioned on the 26th and 27th November with these, as it is very improbable that they were really distinct events. All the dates about this period, especially those taken from the Philosophical Transactions, are most confused, and many of them obviously inaccurate.	



1.	2.	3.	4.	5.	6.
1755, Dec. 27. 15 min. after midnight of the 26th, and at 1 A.M. 30 min. past midnight (or 2 A.M.).	The region of the Lower Rhine, as before, at Maestricht, at  Sedan, Liège, and Cologne.	At Maestricht two shocks at the time stated, the first stronger than the second. At Rocroy a second shock at 12 min. past mid- night. At Sedan and Liège, two, and at Cologne four shocks were felt. Shocks were also felt at 4 A.M.		These shocks were preceded, at Rocroy and other places, by a dull noise, lasting but a short time. The heavens too appeared as if all on fire. No damage was done, except at Chenée, a village near Liège, where the second of the two shocks threw down two houses and shook others. A prolonged noise like that of musquetry was heard there. In the Valais the shocks still continued, they were especially violent at 2½ P.M.	Coll. Acad.; Gazette de France; Journ. Hist.; Phil. Trans., &c.
3½ A.M.	Roussillon, in the neigh- bourhood of Canigou, at the foot of the Pyrenees.	Six undulatory or ba- lancing movements of the earth in the two hours after.		Each movement was preceded by a subterranean noise.	Ditto.
—	At Cordova; Aix in Savoy.	Shocks were felt at these places. The hour not mentioned.			Collection Académique.
—	Brieg in the Valais.....	Two slight shocks ..			Phil. Trans. p. 616.
6 A.M. 6 <sup>h</sup> (Italian time.)	Padua .....	One ditto.....		At the end of this month there was an eruption of Vesuvius.	Ditto, p. 615.
—	Brieg again .....	The shocks recurred ..		Some portions of chimnies were thrown down. The Rhone was often troubled, and appeared to boil during these shocks.	Collection Académique, p. 640.
—	Also at Madrid .....	One shock .....			v. Hoff.
Shortly be- fore 1 A.M.	Dumbarton, Inchin- nan, and other places in Scotland.	Three consecutive shocks.		The shocks were felt in the different stories of the houses at Dumbarton, where birds ap- peared greatly frightened in their cages.	Phil. Trans. p. 509; Coll. Acad.; Gazette de France; Journ. Hist.
1756. Jan. 1. Ancona .....	A smart shock .....	A smart shock .....		But little damage done .....	Gazette de France, 20 Fév.
About 7½ P.M.	2. In the west of Ireland.....	Ditto .....		A meteoric phenomenon (the heavens appearing like a sea of flame), which was probably an aurora, was observed from 4 to 7½ 18 <sup>m</sup> P.M., the latter 18 minutes were the most brilliant. This was soon followed by the shock, which did no damage except at Ballymore, a village some	Journal Encyclopédique, Février et Mars.

— 5 P.M. Briege in the Valais. Also felt at Geneva.	Slight movements	miles from Tsam. A meteor was observed at Perth in Scotland about 9 or 10 P.M., but no mention is made of subterranean commotions.	Phil. Trans. &c., as quoted above.
Given Boston in Massachusetts Jan. 3. Briege	Ditto		Kefertein.
0 A.M.			Phil. Trans. &c.
— 6. Ditto	A rather more violent shock.		Ditto.
8 P.M.	Two ditto consecutively.		Ditto.
— 7. Ditto	One ditto		Ditto.
— 8. Ditto			Ditto.
P.M.			Ditto.
not Rimini in Italy	A slight shock.		Gazette de France, <i>loc. cit.</i> ; Journ. Hist.
— 11. Briege	Two more shocks at the hours stated.		Phil. Trans. &c.
1 A.M.	More slight movements.		Ditto.
— 12. Ditto	Fresh shocks. (This expression perhaps refers to shocks felt in this region on the 1st November before.)	The mines were inundated, and filled with a smell of sulphur. At Oermissen near Herfort, during the night of the 13th-14th, during a violent tempest, the earth opened, forming a pit of 32 feet in diameter, and more than 50 toises deep, and full of water. This may have proceeded from an earthquake, but no shock is mentioned.	Gazette de France, 14 et 28 Fév. 1756; Journ. Hist.; Coll. Acad.; Kant, Géog. Phys.
Prague, and on the frontiers of the kingdom of Bohemia, extending to Barrenstein, Zinnwald and Altenberg.			
— 13. Briege	Slight motion		Phil. Trans. &c.
— 14. Ditto	Violent undulations, lasting but 3 or 4 secs.	No damage done.	Ditto.
A.M.	Tremblings	This is probably only the same event with that v. Hoff. just reported on the 12th.	
In the Saxon and Bohemian Erzgebirge, especially at Altenberg and Zinnwald. Also felt at Erfurt.			
— 15. Briege	A moderate shock in the direction S. to N., followed by others at various hours.	Three hours before the shocks the wind suddenly fell, and a slight trembling was felt. Bodies thrown to the ground were in the direction S. to N., and fissures in the same direction opened in the earth.	Phil. Trans. &c.
— 1 A.M.			

1.	2.	3.	4.	5.	6.
1756, Jan. 15. 4 <sup>th</sup> 30 <sup>m</sup> A.M.	Vercina	A violent shock		This event is only mentioned in the Journal Hist. Jour. Hist. torque, and is probably the same as that of the 1st, one or other date being erroneous.	
	Amersfort in the province of Utrecht.			A shock which caused much consternation, but did no damage. v. Hoff mentions erroneously another shock at this place on the 15th of December before.	Phil. Trans. p. 513.
— 18.	At Lisbon. Also this day at Casal-Maggiore, Ferrara, Spoleto, Albano, Fano, Orvieto, and Rimini.	A trembling, followed by many others, at Lisbon up to the 3rd of February.			v. Hoff.
At midnight.	Brieg	Another shake, rather violent, but very short.			Phil. Trans. &c.
"About this time."	In Peru	An earthquake.			v. Hoff.
— 19.	Brieg	A movement not so great as the last.		The air was very cold.	Phil. Trans. &c.
45 <sup>m</sup> past midnight.	Constantinople	Three rather strong shocks.		Probably at the same time as the last, the one reckoning it as the 19th, the other as the 20th.	Phil. Trans. loc. cit. p. 122.
12 <sup>th</sup> 34 <sup>m</sup> P.M.	Lisbon	More violent shocks.			Journal Encyclopédique, Mars 1756.
— 21.	Brieg	Rather violent.			Phil. Trans. &c.
About 11 P.M.	Ditto	Differing but little in violence from that of the 9th, but very short. Followed by other slighter ones.			Ditto.
A little before midnight.					
— 23.	Ditto	Two shakings, the first the more violent of the two.			Ditto.
In the morning.	Constantinople	Another shock			Ditto.
— 24.	Brieg	Several slight movements.		Also felt at Berne, and at Demonte in Piedmont.	Ditto.
— 25.	Ditto	Ditto		Some persons believed that they felt a shock at Berne.	Ditto.
— 26.	Ditto	Ditto			Ditto.

ON THE FACTS OF EARTHQUAKE PHÆNOMENA.

Date	Location	Description	Source
3 <sup>55</sup> A.M.	Bonn and Cologne	At Cologne a slight shake from E. to W., lasting 7 or 8 sec. At Bonn it resembled that of the 26th Dec.	Coll. Acad.; Journ. Hist. de France.
11 P.M.	Brugg and throughout the lower Aargau.	More shocks	Ditto.
1756, Jan. 27	Brieg	Slight ditto	Phil. Trans. &c.
—	Dalecarlia in Sweden	Some more shocks	Gazette de France, 28 Fév.
Feb. 1	Aigle	More shocks	Bertrand.
2 and 6 A.M.	In Piedmont and Savoy	Slight ditto	v. Hoff; Phil. Trans.
—	—	At 8 <sup>45</sup> A.M. of this day an extraordinary agitation of the waters of Closeburn Loch, a little lake in Dumfriesshire, was observed; the water rising in the centre, and moving in currents in opposite directions for 3 $\frac{1}{2}$ or 4 hours. No shock is mentioned.	Bertrand; Coll. Acad.
—	2. At Aran. Also on the same day in different parts of Switzerland and Italy.	A trembling motion	Kefenstein.
—	5. Ancona	Another violent shock.	Phil. Trans. loc. cit. &c.
—	6. Brieg	Slight tremblings daily from this up to the 13th.	Coll. Acad.; Phil. Trans. &c.
6 A.M.	—	A slight and short shock.	—
—	13. Maestricht	On the 12th and 13th irregularities were observed in the tides at Chesham. Shocks.	—
4 $\frac{1}{2}$ P.M.	—	—	—

1.	2.	3.	4.	5.	6.
Feb. 13. In the island of Corfu. And at Malta? Naples .....	A smart shock. At Malta two ditto. A shock lasting some seconds.	.....	.....	The shock at Malta was in February, and probably on this day.	Coll. Acad.; Gazette de France; Journ. Hist. Gazette de France, 27 Mars.
— 14. Maestricht .....	Another shock; strong and short.	.....	.....	.....	Coll. Acad.; Phil. Trans. &c.
A.M. but mid-Brieg .....	Moderate agitation .....	.....	.....	.....	Phil. Trans. <i>loc. cit.</i>
15. Ditto .....	Two violent shocks at these hours.	.....	.....	A strong wind was blowing at the time .....	Ditto.
and 5½ .....	.....	.....	.....	.....	.....
18. Ditto .....	A violent shock .....	.....	.....	.....	Ditto.
10 <sup>m</sup> A.M. .....	.....	.....	.....	.....	.....
ut 8 A.M. .....	Very extensive shocks. In France the shocks came from S.E. to N.W., or from W. to S.E. (?) At Aire and Sedan they lasted more than a minute. In Holland, where they were very violent, they lasted 1½ min., and then recommenced in 10 or 12 minutes. At Bonn the shocks recurred at 9 A.M., and 20 minutes after. At Liège, &c. In Holland, at Leyden, Amsterdam, the Hague, &c. In Germany, they were felt at Bonn, Cologne, Arensburg, Worms, Mannheim, Darmstadt, Wetzlar, Cassel, Gotha, &c. In England, at London, Dover, Deal, Margate, Canterbury, and even	.....	The waters of the Rhine and Meuse were much agitated during the shocks.	At most of the towns in France the barometer was very low. At Aire and Sedan a subterranean noise was heard. At Metz chimnies were thrown down. The same happened at Aix-la-Chapelle, where the mineral contents of the waters appeared to be suddenly increased. At Cologne and Liège a good deal of damage was done to buildings. In the coal-pits near Liège, the miners, at the depth of 900 feet, heard a rumbling noise above their heads (and then felt the shock), while those above ground heard a similar noise under their feet. Near Stolberg the earth opened and closed again. The earth appears to have been somewhat agitated for an hour together, and during the whole time a low noise was heard. Some people supposed that some of the shocks were attended with flashes of light. The west wind had prevailed for a long time before, and at the time of the earthquake, the barometer, which at Berne was down to 25 in 5½ lines, and magnetic needle were greatly agitated. In England the weather was calm, but soon after a violent tempest took place. All the dates as to hour are given in the time of the places to which they refer.	Coll. Acad.; Phil. Trans. vol. xlix.; Gazette de France; Journ. Hist.; Journ. Encyc.
morning seen 7 and .....	.....	.....	.....	.....	.....
it 8 A.M. .....	.....	.....	.....	.....	.....
7 <sup>h</sup> 56 <sup>m</sup> .....	.....	.....	.....	.....	.....
8 <sup>h</sup> 8 <sup>m</sup> .....	.....	.....	.....	.....	.....
8 <sup>h</sup> 6 <sup>m</sup> .....	.....	.....	.....	.....	.....
8 <sup>h</sup> 30 <sup>m</sup> .....	.....	.....	.....	.....	.....
before 8 .....	.....	.....	.....	.....	.....



1.	2.	3.	4.	5.	6.
Feb. 27. In the Tyrol; at Trente and at Venice. com- menced March.		Several rather violent shocks. They continued more or less for three weeks.	On the 27th, at 6 p.m., at Ilfracombe in Devonshire, the sea rose 6 feet, as on the 1st November, and remained so for half an hour without ceasing to boil as it were in a remarkable manner. No shock is mentioned. During the whole course of the month the tides were very irregular at Chatham, Woolwich, Sheerness, and Deptford.		Coll. Acad.; Gazette de France, 30 Avril; Bertrand; 5th Mem. Journ. Hist. Mai; Phil. Trans. <i>loc. cit.</i>
— At At Rondhelem, twenty end of leagues from Dron- month. them in Norway.				A mountain is said to have fallen and interrupted the course of a river, thereby causing an inundation. No shock is mentioned, and it may have been only a landslide. v. Hoff, on the authority of the Coll. Acad., says in March. The earth had been perfectly still for some days, but this shock, which was followed by many others during March, produced fresh alarm in the city.	Gazette de France, 10 Avril.
Mar. 1. Lisbon		A more violent shock than any felt since the 21st December.			Coll. Acad.; Journ. Hist. Mai, p. 368.
— 3. At Brieg		Several shocks		At Berne, in the Pays de Vaud, in the bishopric of Bâle, and elsewhere, a brilliant meteor was observed at 7 p.m.	Coll. Acad.; Phil. Trans. &c.
— 5. Ditto		Ditto		A second meteor was observed this day at Aigle, Ditto, and Vevey, at which places, as also at Avignon, the former one was seen. At Avignon a third was observed on the 3rd of April.	
— 7. Ditto. At Odovillas also, a village 2 leagues from Lisbon, on the same day.		Ditto. At Odovillas a rather violent shock.		At Odovillas the shock was accompanied by a loud noise like the report of a cannon, repeated many times by an echo.	Ditto; Gazette de France; Journ. Hist.
— 8. Turin		Two slight shocks, apparently from			Phil. Trans. p. 615.
A.M.					





1.	2.	3.	4.	5.	6.
May 22, 25, and 26.	Ulm and Augsburg .....	The earth shook on these days.			v. Hoff.
— 30.	Near Lisbon, in the mountains of Cintra.	The A shock was felt, being the first for fifteen days.		A terrible tempest had raged over the country on the 24th, 25th, and 26th. The Collection Académique gives the date 29th June.	Journ. Hist. Août, 1756, p. 145; Gazette de France, 17 Juillet. Coll. Acad.; Phil. Trans. vol. xlix. p. 893; Gazette de France, 19 Juin.
— June 3.	Aix-la-Chapelle, Liège, Maestricht, Cologne, Duren, Sittart, and the whole country lying between Rhine and Meuse, and which was shaken on the 18th and 19th of February.	The shock was much more violent at Duren than at Aix-la-Chapelle, and was followed by several others over the whole district shaken.			Bertrand; Coll. Acad.; Acta Helvetica, vol. iii. p. 438.
— 7.	In Neuchâtel, at Colombières, and Chaux-de-Fond.	At Colombières it was an oscillatory movement from E. to W. Other shocks followed 18 minutes after. At Chaux-de-Fond there were four periods of disturbance from 8 <sup>h</sup> 45 <sup>m</sup> and another at 11 p.m. The shocks, which were vertical at this place, appeared more violent than elsewhere.			Ditto. Collection Académique.
— 22.	Ditto	More shocks occurred.			Ditto.
— July.	Brieg in the Valais. Also felt in the bailiwick of Interlaken.	Shocks felt at both places.			Gazette de France, 4 Sept.; Journ. Hist. Nov. p. 385.
— 10.	Lisbon .....	Two violent shocks .....		On the 10th a cloud of smoke arose from the ground, which obscured the light of the sun. While this obscurity lasted a smell of sulphur pervaded the air.	Ditto.
— 11.					
— 18.	Ditto .....	Another but a slighter shock.			Ditto.

Aug. 3. Obedas in Portugal.....	A very violent shock.....	.....	A cleft opened, from which a great quantity of water gushed out.	Gazette de France, 25 Sept.; Journ. Encycl. Oct.; Journ. Hist. Nov. p. 386. Phil. Trans. 1757, p. 58.
— 13. In Piedmont, at Turin.....	Slight shocks .....	.....	.....	.....
— 17. Padua .....	Several shocks .....	.....	.....	.....
.....	.....	.....	.....	.....
— — Different places in Tur- key.....	Several shocks during the month.....	.....	.....	.....
Oct. 20. Sicily, and in the Mores, especially in the gulfs of Lepanto and Co- rinth.....	Violent shocks.....	.....	.....	.....
.....	.....	.....	.....	.....
— 22. Naples .....	A violent shock last- ing nearly 4 min. .....	.....	.....	.....
— 29. Lisbon .....	One rather smart shock.....	.....	.....	.....
Nov. 9. Genoa .....	Two undulatory shocks from N. to S.....	.....	.....	.....
— 16. Boston in N. America.....	A slight shock for two seconds.....	.....	.....	.....
— 17. Inverhellan in Argyle- shire.....	Lasted about 20 sec- Two other shocks were felt two days after.....	.....	.....	.....
— 19. Cologne, Liège, Bonn, Malmédy, Maestricht, Limburg, and the whole district between the Rhine and Meuse.....	A shock of thirty seconds duration.....	.....	.....	.....
— 28. Barcellos in Portugal .....	A violent shock .....	.....	.....	.....
— and The island of Sumatra .....	Several shocks during the two months.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
Dec. 4 9.	Cascaes, Cintra, Colares, Oyarat, and Sezimbra in Portugal.	Several shocks		That of the 8th threw down some houses at Sezimbra. The Journal Historique reports these facts and those of the 28th Nov. on similar dates in August and September, but obviously erroneously.	Gazette de France, <i>loc. cit.</i> ; Mercure de France, <i>loc. cit.</i>
— 19. P.M.	Boston in N. America.	A slight shock			Silliman's Journal, vol. xl. p. 206.
— 26.	Several places in Corn- wall.	Several shocks			Collection Académique.
—	In the island of Luçon.	An earthquake		And a volcanic eruption.	Phil. Trans. 1756, p. 458.
—	In Kaitschatka	Ditto		Preceded some moments by a subterranean explosion like that of a cannon.	Gazette de France, 5 Mars; Journ. Hist. Avril, 1757, p. 309.
— 15-16. Jan. Lisbon	One shock				Collection Académique.
— 18. Feb. 4.	In Franche-Comté, and in Alsace.	Several shocks		Preceded and accompanied by subterranean noises. Similar sounds had been heard during the latter end of January; on the 1st (or 21st?), 22nd, 23rd, 24th, and 25th. The Collection Académique gives the date 4th March. That here given is probably the correct one.	Gazette de France, 12 Mars, 1757; Journ. Encycl. Mars, 1757.
— 4. Feb. 4.	Ansto and Aggerschow in Norway.	Two shocks		One of those on the 15th or 16th preceded by a loud noise.	Collection Académique, p. 646.
— 8. and 16. Mar. 1.	Lisbon	More shocks			Ditto.
— 16. 30 <sup>th</sup> P.M.	Ditto	Another, rather violent.		Accompanied by loud subterranean noises	Journ. Encycl. Avril et Mai, 1757; Gazette de France, 16 Avril et 7 Mai; Journ. Hist. Mai, p. 376, et Juin, p. 467.
— 17. P.M.	Ditto	Undulatory ditto		Ditto	Ditto.
— 18. 30 <sup>th</sup> A.M.	Ditto	Ditto		Ditto. Some houses at Cascaes were thrown down by these shocks.	Ditto.
— 15. April (or 7 15).	Salée on the coast of Morocco.	An earthquake of three minutes duration.		Some days before it had been learnt that Cape Cantain had been convulsed by subterranean motion, and that the earth had opened there into fissures in which buildings were swallowed up. v. Hoff says this earthquake at Salée took place on the 5th of April or May. In the month	Collection Académique.

1757. End of June or beginning of July.	Near Cascades in Portugal.	Some more shocks	of April the volcano previously active in the island of Fuego (Cape de Verdes) fell, and buried a village at its foot.	Gazette de France, 6 Août, quoting "la rubrique de Madrid" of July 19.
July 8. 2½ P.M.	Boston in Massachusetts.	A considerable shaking, but lasting a short time only.		Silliman's Journal, vol. xL p. 206.
11½ 45 <sup>m</sup> P.M.	Throughout the Azores.	A terrible shock, lasting about 2 minutes. It was at first vertical, but soon changed to horizontal, in the direction W. to E.	All the houses of Angra (Terceira) were violently shaken. In the island of St. George (12 leagues from Terceira) 1053 persons were destroyed beneath the ruins of their houses.	Collection Académique; Mercure de Madrid, 1757, Dec.; Dulac-Mélanges d'Hist. Nat. t. iv. p. 333; v. Buch, loc. cit. p. 368; Journ. Hist.; Gazette de France; Journ. Encycl.
10. About 10 A.M. and 4 P.M.	Ditto. But feebly felt in the island of the Pic, except in the quarter opposite to the island of St. George. The shocks were also slight in the islands of Fayal, St. Michel and St. Marie. In one or two of the islands nothing was felt.	Another shock at 10 A.M., followed by one at 4 P.M. as violent as that of the day before, but shorter. Slight shocks did not cease until the 2nd Sept.	Eighteen new islets made their appearance at 100 fathoms to the N. of the island of St. George. Immense ruins were caused in all directions. Great landlips took place, the detached masses sliding into the sea, and in some cases holding together with the houses, &c. on them, and appearing as islands above the surface. Monte Formoso, in the E.S.E. of this island, separated into two parts, of which one fell into the ocean, and was separated more than 100 fathoms from the remainder. In the island of Topo terrible devastation took place. The earth opened in several places, and a piece of land of nearly a quarter of a league in size slid into the sea. In some localities the hills changed their place, and in others they disappeared altogether. A part of the village of Norte Grande was separated to the distance of 150 fathoms from the rest, forming a new island. The falling masses of rock and the gaping chasms in the earth terrified the inhabitants so much that they lived solely in the woods.	Ditto.



Dec. 31. 1758. 6 A.M.	Especially at Evora. Lisbon	same hour. A single shock lasting 30 or 32 secs. It was the most violent felt there since the 1st Nov. 1755, even than that of the 9th Dec. 1755.	Accompanied by a loud explosive noise. No damage was done.	Collection Académique; Gazette de France, 4 Mars; Journ. Hist. Avril, 1758, p. 309.
1758. Jan. Beginning of the month (or in Dec. 1757).	Province of Constantine in North Africa, and at Tunia.	Fresh shocks of earthquake, some very violent.	Some time during this year a remarkable submarine eruption took place 3 leagues from Pondicherry in the East Indies. The province suffered very much, and at Tunis the houses fell in great numbers, several thousand people perishing in the ruins. This account is taken from a letter from Genoa of the 18th January; the shocks may therefore have taken place in 1757.	Journ. Hist. Mars, 1758, p. 238.
2 A.M.	In the parishes of Worth and East Grinstead in Sussex, Lingfield in Surrey, and Edenbridge in Kent.	A slight trembling, lasting but a moment.	Accompanied by a rolling noise. The windows were made to rattle.	Phil. Trans. vol. 1. pt. 2. pp. 614 & 645.
Same day, in the daytime and at night.	At Herculanum	An earthquake	v. Hoff erroneously gives the date 24th March...	Ditto, p. 622.
and in Feb. 9th Feb.	Lisbon	More shocks in these two months.		Gazette de France, 29 Avril
Beginning of the month.	At Naples. And about Vesuvius.	A trembling at Naples. On Vesuvius the shocks were violent.		Ditto, 25 Mars.
Apr. 13.	At sea, in 0° 20' S. lat., and 23° 20' W. long.		The frigate La Fidéle, Capt. Lehoux, experienced shocks here on this day.	Dausy's Memoir, as quoted above.
21. 9th P.M.	Annapolis in Maryland, and more feebly in Pennsylvania.	A trembling, lasting thirty seconds.	Preceded by subterranean noises, which increased by degrees.	Collection Académique, t. vi. p. 648.
July 3. 0 <sup>h</sup> 45 <sup>m</sup> A.M.	Lisbon	A somewhat violent shock.	Preceded by subterranean noise. The shock was felt in all quarters of the city. In the month of May the island Bondico, or Pondico, and two other small isles near it (in the gulf of Zeitoun, near Negropont), sank suddenly into the sea. No earthquake is mentioned.	Coll. Acad.; Almanach de Dijon, 1759, p. 146.

1.	2.	3.	4.	5.	6.
Aug. Re- ting of month. Nov.	Vesuvius .....	A slight shock.....		Followed by an eruption from the summit of the volcano.	Gazette de France, 30 Sept.
	Etna, in the direction of Bronte.	A violent ditto .....		Followed, after some time, by a slight eruption. A little lava flowed from the crater. Both Etna and Vesuvius, having been almost com- pletely at rest since 1755, began to show symptoms of activity about this time.	Ferrara, Descrizione dell' Etna, p. 121.
Dec.	Consantinople .....	A rather violent shock, lasting however only a short time.		Very little damage done.....	Gazette de France, 10 Fév. 1759; Journ. Hist. Mars, p. 223.
— 6.	In Russian Lapland, A considerable earth- quake. It lasted three hours accord- ing to some, or only half an hour accord- ing to other accounts.			A terrible tempest, which lasted the same time as the earthquake, accompanied it. The storm threw down many houses in Arch- angel, where the earthquake was not felt.	Coll. Acad.; Abb. d. Acad. v. Stock- holm (German translation), 1759, p. 221.
— 20.	London and the neigh- bourhood.	A slight shock.....			Gazette de France, 6 Janv. 1759.
— 31.	In Kemi, Lapland. Also at 11½ at the same time in England.	Two shocks.....		Preceded by a subterranean noise. Perrey aug- gests that the shock in England referred to may be that of the 20th.	Coll. Acad. t. xi. p. 13; Abb. d. Acad. v. Stockholm (German translation), loc. cit.
Jan. 20.	Leighorn .....	A considerable shak- ing.		In the beginning of the month the mountain, called General's Bergsund, near Stockholm, is said to have fallen. No mention is made of any earthquake shock being perceived.	Collection Académique.
Feb. 2.	Boston in Massachu- setts.	One shock .....		Preceded by a rumbling noise .....	Doddeley's Annual Register, vol. ii. p. 88.
— 24.	Liskeard in Cornwall ...	Ditto, of a vibratory character, lasting two or three secs.		Blood-red rays were observed, converging to one dark spot in the heavens. This phenomenon lasted fifteen minutes. (Probably an aurora.)	Ditto, vol. ii. p. 73.
— of the th. Mar. 18.	In Berbice, Surinam, and S. America. Pistoia in Italy .....	Violent shocks.....			Collection Académique, p. 649.
April 18.	Ditto .....	A strong trembling motion.			Ditto.
	Another ditto .....			v. Hoff does not mention any shock on the 18th. of March. It is probably a mistake. During	Ditto.

1759. Apr. 23. Liabon .....	Rather heavy shocks .....	this month, and until August next, Etna was in eruption, and Vesuvius recommenced its activity.	Ditto, p. 650.
— May. The country around Etna. Middle of the month. ....	Very sensible shocks .....	The volcano was in active eruption .....	Ferrara, Descrizione, &c. p. 121.
— 20. Naples, Milan, and several other cities of Italy. ....	Violent shocks .....	At Marisco-Nuovo (near Naples) the shocks were so violent that the people lived in the open country under tents.	Collection Académique.
— 26. ....	Very slight shocks .....	.....	Phil. Trans., vol. li. p. 529.
— June 10. Aleppo .....	A very violent shock, followed by two others in the space of three hours. ....	.....	Collection Académique.
— 22. Salonica .....	More shocks, of which one was very intense. ....	.....	Ditto.
— 23. Ditto .....	Two more violent shocks. Fifty-four had been counted up to this date, and more were felt in July, August and September. ....	Philippopoli suffered much from this earthquake.	Ditto.
— 29. Ditto, and the town of Philippopoli near Salonica. ....	Numerous shocks, were felt for fifty or sixty days, up to the end of August. ....	Constantly accompanied by horrible subterranean explosions.	Soaneschmidt, Mineralog. Beschreib. d. vorzüg. Bergw. Revere v. Mexico, 1804, S. 325; Humboldt, Versuch üb. Neu Spanien. Th. ii. S. 145; ditto, Ideen zur Geogr. d. Pflanzen. u.s.w. S. 154; Atlas Pittoresque, p. 243.
— Aug. 10. Bordeaux. Also felt at Limoges and in the Limousin. ....	At Bordeaux two violent shocks from W. to N.E., each lasting two or three seconds. At Limoges but one shock, lasting about a minute, was felt. ....	Preceded by a loud rumbling noise for two or three seconds (or half a minute according to others). This noise continued during the shock. Although the weather was quite calm the lower region of the air was full of clouds in a state of agitation. Doors and windows shook violently; and one or two buildings were injured. At Limoges the subterranean noise was also heard.	Coll. Acad.; Gentleman's Magazine.



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Aug. 23. Brussels .....	.....	Lasted about one minute.	.....	The air became very calm immediately after the shock.	Gentleman's Magazine, vol. xxix. p. 391.
Sept. 1. The region around S. Pedro de Xorullo in Mexico.	.....	Most violent shocks	.....	During these shocks the plain became convulsed and raised, flames bursting forth in many places, and six principal hills, besides many smaller ones, were upheaved, of which the highest attained the elevation of 1477 feet above the former level of the plain, or 5170 feet above the sea, and has since remained an active volcano, known as that of Xorullo. For a particular account of this eruption see Humboldt's works referred to.	Humboldt's works, as quoted above (under June).
Oct. 30. Aleppo, Damascus, Tripoli, and along the coasts of Syria, over a space of about 100 leagues square, the centre being supposed to be Saphet.	.....	Very violent shocks, followed by other slighter ones up to the 25th November.	At Acre the sea rose 7 or 8 feet above its ordinary level, inundating the streets.	Preceded by a rumbling noise. At Damascus, Latakiah, Saphet: many other towns, and all the villages of the mountain region of Libanus were greatly injured, vast numbers of houses and mosques being thrown down, and very many people killed. In the valley of Baalbeck 20,000 perished.	Phil. Trans. vol. li. p. 529; Hist. de l'Acad. de Paris, 1760, p. 23; Mercure de France; Gazette de France, &c.
Nov. 25. Ditto .....	.....	Another violent earthquake. The first shock lasted two minutes, and was followed by another, but feebler one, eight minutes after.	.....	The motion was at first a trembling one, but soon changed to violent oscillations, which latter principally caused the fall of buildings, &c.	Ditto.
— 25. Ditto .....	.....	At Aleppo a shock as violent as the first, followed by a slight undulatory one at 9 A.M., and by five others up to the following day.	.....	.....	Ditto.
— 28. Ditto .....	.....	Two very violent shocks at the hours mentioned.	.....	Numbers of houses were thrown down by these later shocks, which had escaped the former ones.	Ditto.
Dec. 22. Gothenburg, Jönköping, Örebro, and Celsing in Sweden.	.....	Several shocks	.....	Chimnies were thrown down at Gothenburg ...	Gazette de France, 12 et 19 Janv. 1760; Coll. Acad.

1760. Jan. ....	November. Ditto, especially at Mar- jorj in Lebanon.	Ditto	.....	In the beginning of this year a great fall of a mass of rock near Drontheim in Norway is recorded by the Gazette de France, but no earthquake shock is mentioned.	Ditto; Volney, Voyages, 2 <sup>e</sup> édit. t. i. p. 270.
4½ A.M.	11. Lisbon .....	Two shocks .....	.....	Preceded by a subterranean noise .....	Collection Académique.
1½ P.M.	16. Aix-la-Chapelle .....	A vibratory motion, with several smart shocks.	.....	Accompanied by great blasts of wind, increasing and decreasing with the shocks.	Doddesley's Annual Register, vol. iii. p. 69, 70.
19 and 20. 8 and 10½ P.M.	18. Ditto .....	Ditto .....	.....	.....	Ditto.
7 P.M.	20. Wicklow in Ireland ...	Vibratory .....	.....	.....	.....
10½ P.M.	Amsterdam and Maa- tricht. (The Coll. Acad. says on the 19th, 20th and 21st. at Am- sterdam, Leyden and Utrecht. The hour here given must refer to some of these shocks.)	Three shocks at Am- sterdam.	.....	A noise like a heavy carriage driving along was heard. Lightning and a slight trembling of the earth were observed before the shocks.	Ditto; Gentleman's Magazine, vol. xxx. p. 99. Doddesley's Annual Register, loc. cit.; Coll. Acad.
Hour not given	Paris and Versailles And, same day, at Vé- zelay in Burgundy.	Slight shocks .....	.....	The Annual Register says, <i>about the same time</i> as the shocks in Holland, others were expe- rienced in France, Portugal and other parts of Europe. Antwerp is also mentioned as having felt these about the 20th, but the exact day is not given.	Ditto; Gazette de France, 2 Fév. et 8 Mars.
21. Cologne .....	Hamburg and Copen- hagen.	One shock, followed by three less vio- lent. Direction, N. to S. At Hamburg they lasted half a minute, at Copen- hagen one minute.	.....	.....	Annual Register, loc. cit.
Morning. ..... Night and 22. 21 and 22.	.....	.....	.....	.....	Ditto.

1.	2.	3.	4.	5.	6.
1760. Jan. ....	In the Margravate of several shocks. Aurona.			Some damage done at Cascia.	Collection Académique.
— Feb. 3. ....	New England				Doddesley's Annual Register, vol. iii. p. 92.
— — 7. ....	Jamnicia	A violent shock		No damage done.	Gazette de France, 3 Mai, 1760; Journ. Hist. Jun, p. 465.
— April. ....	Truxillo in Peru				Annual Register, vol. iii. p. 108; Coll. Acad.
— May 26. ....	Mezzo in the territory of the republic of Ragusa.	A trembling of 4 min. duration.			Coll. Acad.; Gazette de France, 28 Jun; Journ. Hist. Août, p. 151.
— June 16. .... 4 P.M.	Beneath the sea at Portici.	A very violent earthquake.	The sea was so opened and divided by the disturbance that it left the bottom dry for 2 mins.		Journ. Enceyl. 1 Juillet.
— — 20. .... About 11 A.M.	Brussels, some other places in Brabant, and those of the 20th at Cologne.	Shocks slighter than those of the 20th Jan. before.			Collection Académique.
— — July 16. .... 1 <sup>h</sup> 47 <sup>m</sup> A.M.	Brussels and several other towns of Brabant.	Three or four undulatory shocks.			Coll. Acad.; Phil. Mag. July 1828, p. 55; Annual Register.
— Aug. 13. .... About 7 P.M.	Constantinople and Vienna.	A very slight shock felt at each place at the same hour.			Journ. Hist. Oct. 1760, p. 302.
— — 14. ....	Salonica	One shock			Gazette de France, 6 Déc., quoting a letter from Salonica of the 29th Aug.; Journ. Hist. Janv. 1761, p. 75.
— — 15. .... 1 <sup>h</sup> 56 <sup>m</sup> A.M.	Ditto	Ditto		Followed by a brilliant meteor	Ditto.
— — 17. .... 9 P.M.	Ditto	Ditto		Violent thunder, wind and rain immediately succeeded the shock.	Ditto.
— — 21. .... 11 <sup>h</sup> 30 <sup>m</sup> A.M.	Ditto	The last shock. All four appeared to act in a vertical direction.			Ditto.
— — Oct. 13. ....	Lisbon	Two shocks			Collection Académique.
— — Oct. 13. ....	In Syria	Several shocks			Brewster's Encyclopædia, article Chronology.
— Nov. 9. ....	Boston in Massachusetts	A slight shock		More considerable in the country round Boston	Gazette de France, 31 Janv. 1761;

8 A.M.	setts, and the country for thirty miles round.		than in that place itself. In the country a subterranean noise was heard.	Journ. Hist. Mars, 1761, p. 230; Mercure de France, Mars, p. 205; Annual Register, vol. iii. p. 149.
1760. Dec. 21 and 22.	Veausius	Several shocks.	Followed on the 23rd and following days by one of the most remarkable eruptions of Veausius.	Gactano de Bottis, Ragionamento Istoricco, &c., quoted by v. Hoff; Della Torre, Supplemento alla Storia del Veauvio, Napoli, 1761; Hamilton's Campi Flegrei; Phil. Trans. vol. lii. pt. 1. pp. 39-44.
— 27.	Ditto	Violent ditto	.....	Ditto.
— 28.	Ditto, and at Portici. Many of the shocks were felt as far as Naples.	Ditto, followed by tremblings more or less violent up to the 5th January.	The eruption continued with varying intensity up to the 6th January.	Ditto.
—	Lima in Peru	Several shocks during the month.	.....	Annual Register, vol. iv. p. 189.
1761. Jan. Night of 4-5.	Portici and Naples	Violent shocks	During the eruption of Veausius the houses were much shaken.	Gactano de Bottis, &c., just quoted.
— 8.	Lima in Peru	.....	.....	Annual Register, loc. cit.
—	Naples	A violent shock	The summit of Veausius fell in at this time. The Journal Historique gives the date 11th Feb.	Gazette de France, 7 et 21 Fév.; Journ. Encycl. 1 et 15 Fév.
Night of 11-12.	Zuyglius near Grenoble.	Three shocks felt	During a terrible tempest the earth opened, and flames came out thence some days after.	Journ. Encycl. 15 Fév.
10 P.M.	24. Hermösand in Sweden.	Violent shocks	Accompanied by a subterranean noise, and preceded by a terrible storm, which lasted up to 10 o'clock (of the night before?).	Gazette de France, 18 Avril, 1761.
7 A.M.	Ditto	Another earthquake.	At the same time an aurora borealis of great extent was observed. It had been remarked for some time before that auroras appeared after tempests and earthquakes.	Ditto.
— 25.	Ditto	.....	.....	Journ. Hist. Juillet, 1761, p. 65.
— Feb. Be-	Boston in Massachusetts.	A slight shock.	.....	Annual Register, vol. iv. p. 69.
gining of the month.	6. Sturminster	.....	Attended with a rumbling noise	.....
Between 11 and 12 P.M.	In North America	Violent shocks	Unattended by any damage	Journ. Encycl. 15 Mai, p. 163.
and Mar. 12.	Boston in Massachusetts.	Two shocks from S.W. to N.E. The second of the two the greater.	The weather was perfectly calm. The sky over-head was clear, but the horizon all round was obscured by a whitish fog, looking as if there were a light behind it.	Annual Register, vol. iv. p. 117.
— 16.	Boston in Massachusetts.	They lasted 20 sec.	.....	.....

1.	2.	3.	4.	5.	6.
<p>Mar. 31. At Lisbon, Setuval, Oporto, and all along the coast of Portugal; at Madrid, Aranjuez, &amp;c. in Spain. Some vessels at sea off Lisbon (as H.M.S. Gosport) in lat. 44° 8' N. and long. 5° 10' W., and the convoy along with her experienced the shocks. At Santa Cruz in Barbary; at Bayonne, Bordeaux, France; at Amsterdam in Holland; at Cork in Ireland; at Funchal and throughout the island of Madeira; and at the Azores.</p> <p>(?) M. (?) Noon. 35<sup>h</sup> 35<sup>m</sup> A.M. 2 o'clock (in time.)</p>	<p>At Lisbon a very violent earthquake (the most so since the 1st Nov. 1755); in a perpendicular direction from below upwards. The movement lasted 5 min., and was followed by another shock at midnight and three more during the night. (Others were said to have been felt before noon.) At Oporto the direction appeared to be N. to S. At Madrid the shock lasted 2½ min., at Aranjuez 3 min. On board H.M.S. Gosport and the other vessels two shocks were felt, one at 11<sup>h</sup> 45<sup>m</sup>, and the other at 11<sup>h</sup> 50<sup>m</sup>. The first lasted 1½ min., the second not so long. At Santa Cruz in Barbary a slight shock only, lasting a quarter of a minute. At Bayonne the duration of the motion was 3 min. At Cork the shocks were violent, undulatory,</p>	<p>An hour and a half after (or according to others, during) the shock the sea rose 8 feet at Lisbon, and continued to ebb and flow to this extent at intervals of 6 min. until evening. At Cape Finisterre an extraordinary flux and reflux of the sea occurred at 15 min. past 12. The shock was perceived on board a vessel near the coast here. Vessels in the harbour of Amsterdam were much agitated. At Cork no commotion of the sea was observed, though the shock was felt there, while at other places on the coast where it was not sensible the agitation of the water was very considerable. Thus at Kinsale (at about 5<sup>h</sup> 30<sup>m</sup> or 6 p.m.) at dead low water the sea suddenly rose 2 feet, and then retired in about 4 min. This occurred several times. At Carrick the waters of the river Suir rose about 4 p.m.</p>	<p>Owing probably to the perpendicular direction of the shock very little damage was done at Lisbon. At Oporto much injury of houses, &amp;c. took place according to some, while other accounts say directly the reverse. St. Ubes suffered much. On board H.M.S. Gosport it felt as if the cables were running rapidly round the bits in letting go anchor. A submarine noise was heard, and after the shock several of the vessels of the convoy were found leaking. At Corunna no houses fell, though many were moved from their positions; one more than 4 feet towards the sea, and its front towards the sea was altered in aspect more than two points of the compass. Several chasms formed in various places in the earth, from which sand and shells were thrown up. In some of the churches of Amsterdam the chandeliers swung a foot from their former position. At Funchal in Madeira a noise like that of carriages was heard before the shock. On the eastern coast of this island rocks were detached from their places, and rolled into the sea. The wells were turbid, and walls of 2 feet thick, running N. to S., were damaged. 4<sup>h</sup> 30<sup>m</sup> Barbadoes time = 8<sup>h</sup> 30<sup>m</sup> Lisbon time; hence the agitation of the waves at Barbadoes occurred about 8½ hours after the shock at Lisbon.</p>	<p>Phil. Trans. vol. lii. pp. 141 &amp; 418; Gazette de France, 2, 9, 16 et 30 Mai; Journ. Encycl. Avril et Juin; Journ. Hist. Juin, p. 466; Annual Register, vol. iv. p. 92.</p>	

1761. March. of the End of the month.	Thessalonica .....	Several shocks from S.W. to N.E.	<p>from E. to W. and vice versa, lasting a minute. At Fun- chal in Madeira a very violent earth- quake. The vibra- tions were very ra- pid, and consisted of two periods, of increase and de- crease. Their direc- tion seemed to be E. to W., and their duration 3 min.</p> <p>to the extent of 4 feet in the space of 5 min. At Duagarvan five ebbings and flowings of the sea were ob- served between 4 and 9 p.m. At Ross in co. Wexford, a vio- lent agitation of the river there took place about 7 p.m., and at Waterford the sea ad- vanced 30 feet on the shore. At Mount's Bay in Cornwall, about 5 p.m., the sea rose 6 feet five times in the space of an hour. At the same hour it rose 4 feet at the Scilly Isles, the motion lasting two hours. At Fort An- gustus in Scotland the waters of Lough Ness rose and fell 2 or 2½ feet for three quarters of an hour, about 2 p.m. At the islands of Madeira and Terceira violent agitation was ob- served, and at Barba- does (no land shock), from 4½ p.m. to 6 the next morning.</p>	<p>Preceded by a sound like that of the wind rising in the distance, and accompanied by a rum- bling noise. Very probably these shocks were connected with that at Lisbon just de- scribed.</p>	Annual Register, vol. iv. p. 94.
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Apr. 9. Santa Cruz in Barbary .. P.M.	Another shock, more violent than that of the 31st March.			The walls of most of the houses were split .....	Annual Register, vol. iv. p. 95.
— 14. Terceira in the Azores...	Three slight shocks.				Same authorities as for the 31st Mar.
— 15. Ditto .....	A very violent shock.				Ditto.
	The earth continued to tremble slightly up to the evening of the 17th.				
— 17. Ditto .....	Two more, very violent.			On the 18th a thick smoke appeared at 3 leagues to the N.W. of Angra. Subterranean noises like thunder had been heard for three days. On the 20th the earth opened, and three volcanoes formed, from which torrents of sulphurous and inflamed matter came forth. One village was almost completely reduced to ashes. Balbi (Essai, t. i. p. 102), as quoted by v. Hoff, gives a violent earthquake at Lisbon on the 30th of this month, but no other author mentions it, and in all probability v. Hoff is right in supposing it to be a mistake, the event of the 31st March being what is referred to.	Ditto.
June 9. Sherborne, Shaftesbury, An earthquake .. 5 <sup>m</sup> A.M. and the country for 13 miles round.					Annual Register, vol. iv. p. 121; Gazette de France, 11 Juillet; Journ. Hist. Août, p. 149.
July 5. Madeira .....	Ditto		On the 28th of this month an extraordinary agitation of the sea was observed at Mount's Bay, Falmouth, Fowey and Plymouth, on the south coast of England. No land shock is mentioned.		Annual Register, vol. iv. p. 132; Phil. Trans. <i>loc. cit.</i> p. 507.
Aug. 14. Guernsey .....	Ditto		A violent swell of the sea set in from the S.W., the wind being E. at the time.	Accompanied by a hollow rumbling noise .....	Gentleman's Magazine, vol. xxxi. p. 378.

1761. Aug.	Santa Cruz in Barbary ..	Two shocks felt in this month.	.....	.....	.....	Annual Register, vol. iv. p. 154.
— Oct. 16. Between 8 & 9 A.M.	At Verpillère and the adjoining villages, on the route from Lyons to Grenoble.	One shock .....	.....	.....	Accompanied by noise, which terrified various animals.	Gazette de France, 24 Mai, 1762.
— Nov. 2. N.S. 1 P.M.	Fortin Nowikowski in Siberia.	A slight trembling motion.	.....	.....	Accompanied by a rolling subterranean noise.	Phil. Trans. vol. lxi. p. 204.
— — 6.	Ternel in Portugal .....	Three shocks, of which the first lasted several minutes.	.....	.....	Lightning was observed the following day at 4 A.M.	Gazette de France, 25 Janvier, 1762.
— — 13. 2 <sup>h</sup> 30 <sup>m</sup> A.M.	Geneva .....	A slight shock .....	.....	.....	Accompanied by a dull noise. A meteor of the form of an immense globe, which afterwards changed to a train of light and disappeared with an explosion, was observed at the same time.	Ditto, 28 Nov.
— Dec. 9.	Carthage .....	An earthquake .....	.....	Two Spanish men-of-war were driven on shore by the sea.	Preceded by a violent storm from the south.	Annual Register, vol. v. p. 76.
— — —	North-west of the chain of the Altai. Felt at the mines of Koliwan, at forts Czeginak and Ineck, at Ust-Kamenogorski, Schoulbinsk, Simpalat, Jamischeff and Barnaul. The earthquake, therefore, extended about 1000 versts from E. to W., from Barnaul to Ust-Kamenogorski, and from thence northwards, to Schoulbinsk and Sempalatnaja.	Direction of the earthquake = E. to W., and duration 3 min. at the mines of Koliwan. At Ust-Kamenogorski and all the environs on the Irtysh the duration was 20 minutes. At Schoulbinsk on the Irtysh it lasted 3 or 4 minutes in the direction S. to N. At Simpalat some said the direction was E. to W., others, S. to N. At Jamischeff the shock lasted 12 min., and at Barnaul its direction was S. W. to N. E.	.....	.....	Great floods came down from the mountains after the shock.	Phil. Trans. loc. cit.
— 12. N.S. Between 7 & 8 P.M.	Ditto .....	Another shock, as violent, but shorter.	.....	.....	menogorski the noise appeared to come from the east and to go towards the north. The bastions of the fort of Ineck were violently shaken.	The Annual Register says merely, "Oti in Siberia," but it obviously refers to the same event.
— 12. N.S. Between 7 & 8 P.M.	Ditto .....	Another shock, as violent, but shorter.	.....	.....	.....	Journ. Encycl. 1 Mai, 1762; Annual Reg. loc. cit.



1.	2.	3.	4.	5.	6.
Jan. 11. —	Near Montfort l'Amaury (département Seine et Oise) in France.	Several shocks from E.S.E. to W.N.W.		Preceded by a severe storm during the day .....	Hist. de l'Acad. de Paris, 1762, p. 36; Coll. Acad. t. xli. p. 45.
—	In the district of Albano in the Estates of the Church.	Tremblings which recurred for thirty-four days.			Preuss. Staatszeitung, 1829. No. 170.
March. —	In Tuscany and the territory of Bologna.	Several shocks.			Gazette de France, 16 Avril.
— 16. —	Wexford in Ireland.	A strong shock, but of short duration.			
— 20. —	Shaftesbury in Dorsetshire.	One shock.			
April 2. —	Bengal, Arracan and Pegu. The region especially shaken was the northern part of the coast of the Bay of Bengal, extending from the eastern bank of the Burramputra to Calcutta, Dacca, Ghorroty, Calcutta, Deep Gong, and many other places are mentioned as having suffered.	A very violent earthquake. The motion was at first gentle, but gradually increased, so that people walking could hardly keep their feet. At Calcutta it lasted ten minutes.	At Dacca the river was so violently agitated that some hundred boats were thrown out on dry land.	Preceded by a rumbling noise. A violent gale the same day threw many ships upon the coast. Accompanied by a very considerable subterranean noise.	Annual Register, vol. v. p. 74; Gazette de France, 9 Avril. Gazette de France, 16 Avril.
— 9. —	Koliwanowofreschkoy in Siberia.	Lasted about three or four minutes.			Phil. Trans. vol. lili. p. 251; Annual Register, vol. vi. p. 60.
— 12. —	Ditto.	Ditto.			Annual Register, vol. v. p. 80.
—	In the Mugello in Italy	Eleven shocks, of which some were rather violent.			
ht of 13. —	Two slight shocks at Florence, more violent in the Mugello.				Gazette de France, 3 et 14 Mai; Journ. Encycl. 1 Juin.
— 15. —	At Florence. Also in the Mugello.				Ditto.

1762. April 17. In the Mugello May 5. Verpillere on the route 9 <sup>th</sup> 28 <sup>m</sup> P.M. from Lyons to Grenoble.	Another shock. A shock lasting a minute.	At Bergen in Norway, on the 26 <sup>th</sup> of May, the sea ebbed and flowed with pre- ternatural violence. No earthquake men- tioned.	Several houses were thrown down Accompanied by subterranean noise. Animals appeared much frightened, and horses neighed	Ditto. Gazette de France, 24 Mai; Annual Register, vol. v. p. 87.
June 13. Adrianople Foggia in Italy	A violent shock Rather violent trem- bling.	A violent shock Rather violent trem- bling.	A village was overwhelmed near Salerno	Gazette de France, 9 Août. Ditto, 16 Juillet.
July 13. Calcutta 2 $\frac{1}{2}$ P.M.	Two (or three) ocu- latory shocks, last- ing a few seconds.	Two (or three) ocu- latory shocks, last- ing a few seconds.		Phil. Trans. vol. lxxx. p. 258; Annual Register, vol. vi. p. 61.
23. Arles in France 7 $\frac{1}{2}$ P.M.	A slight shock.	A slight shock.	The weather very serene and hot	Gazette de France, 6 Août.
Night of 28 to 29.	In the Mugello. In the islands of Ischia Com- micchiola.	In the Mugello. In the islands of Ischia Com- micchiola.	Little damage was done, except in the two islands spoken of, where considerable injury to houses, &c. occurred.	Ditto, 20 et 23 Août.
31. Bonn 1 P.M.	One shock, followed at midnight by others lasting 30 seconds.	One shock, followed at midnight by others lasting 30 seconds.	On each occasion preceded by subterranean noises.	Ditto, 13 Août.
Aug. 1. Ditto 11 A.M. Brussels	Two more shocks A trembling lasting 10 to 20 sec.	Two more shocks A trembling lasting 10 to 20 sec.		Ditto. Communication of M. Quetelet to M. Perrey. (See memoir of the latter on earthquakes in France, Holland and Belgium.)
Oct. 6. Rome, Aquila, and the environs.	A violent shock, espe- cially at Aquila.	On the 27 <sup>th</sup> of Septem- ber the Thames rose suddenly in the midst of a dead calm, and dashed the ships violently against one another.	The principal buildings of Aquila were injured. The adjoining village of Poggio-Picenza was entirely ruined.	Gazette de France, 1 et 8 Nov.; Annual Register, vol. v. p. 105.
Nov. 2. At the Dardanelles between 11 A.M. and noon.	Two rather violent shocks.	Two rather violent shocks.	A terrible storm took place on the 7 <sup>th</sup> , which threw down many houses.	Gazette de France, 14 Janv.; Journ. Encycl. 15 Janv. 1763.

1.	2.	3.	4.	5.	6.
Nov. 6. Aquila in Spain .....	An earthquake .....			Several houses were thrown down, and the walls of the church cracked from top to bottom.	Annual Register, vol. v. p. 108.
— 8. Jamaica .....	A violent earthquake .....			The inhabitants quitted Port-Royal in alarm, but no considerable damage occurred.	Gazette de France, 25 Fév. 1763.
— 13. St. Jago de la Vega .....	Lasted 15 secs. ....				Annual Register, vol. vi.
Dec. 3. Chili .....	An earthquake .....		On the night of the 28th and 29th of December the river Eden in Cumberland, near Armthwaite, fell suddenly 2 feet, and remained so until 11 o'clock the following morning, when the water gradually rose again, though neither rain nor snow had fallen. No shock is said to have been felt.	Accompanied by a volcanic eruption from a mountain near Peteroa, upon which a new crater formed. On a neighbouring height a cleft appeared in the earth of many miles long (?); and a mass of earth slid into the valley of the river Lontue, and thereby obstructed its course for ten days, forming a lake of no inconsiderable magnitude.	Lyell's Principles of Geology, vol. i. p. 438; Malina, Saggio della Storia Nat. del Chili, Bologna, 1810; Biblot. Italiana, vol. i. p. 56; Phil. Trans. vol. lxxi. p. 7.
1. Jan. 13. West Nordland in Swe- den. ....	Earthquake shocks .....			Accompanied by subterranean noise, a hissing sound in the air, and luminous meteors.	Collection Académique, t. xi. p. 13.
— Smyrna .....	A violent shock .....				Gazette de France, 18 Mars.
Feb. 6. Bronte and the country round Etna for thirty miles in circumfe- rence. ....	Many shocks, which became more vio- lent daily. One especially so took place on the 6th at night. ....			Accompanied by an eruption, during which cracks opened in several places in the older lava, and fresh molten matter flowed out. Smoke, ashes and red-hot stones were ejected with the greatest violence from the crater. Towards the middle of the month the violence of the eruption diminished, but before the beginning of March it had not altogether ceased.	Ferrara, Descrizione del Etna, p. 122.
Mar. 11. Bayonne .....	A very slight shock .....				Gazette de France, 8 Avril.
— 12. Ditto .....	Another ditto .....				Ditto.
4 A.M.					

1763. Mar. 13. 1½ A.M.	Pau in the Pyrenees ...	A rather strong shock		Accompanied by a subterranean noise which appeared to come from the Pyrenees.	Ditto.
— May 22. 1½ P.M.	Malta	A considerable trembling, lasting 1 min.			Journ. Encycl. 1 Juillet.
— June 18	Around Etna	More shocks, which continued up to the 1st of July.		The eruption was renewed with great violence, and the volcano remained active for three months, during which time the crater itself was at rest; but huge clefts opened in the earth, from which so much solid matter was ejected, that a new hill, called Monterosso, was formed thereby.	Ferrara, Descrizione, &c. &c. cit.; Gazette de France, 1 et 12 Août.
— 28. About 5½ A.M.	Hungary. Felt at Comorn, Raab, Pesth, Buda, Kerepas, Temeswar, Belgrade, Schemnitz, Vienna; and extending even to Dresden and Leipzig.	Very violent. At Comorn the first shock took place at 5 A.M., and was followed by another at 5½ 22 <sup>nd</sup> or 23 <sup>rd</sup> . This second was much more violent than the first. At Pesth the first shock at 5 A.M. was slight, but that at 5½ 45 <sup>th</sup> very severe. At Schemnitz shocks were felt at 2½ 5½, and 5½ 28 <sup>th</sup> . At Vienna, at 5½ and 5½ 10 <sup>th</sup> , but slight, as they were also at Dresden and Leipzig. Up to the 4th of July 90 shocks were counted at Comorn.	Two bastions of the fortress of Comorn, on the Danube, were destroyed by the violent agitation of the waters of the river. Water mingled with sand and having a sulphurous odour, were thrown up from the river to the height of 5 feet in jets as large as a man's arm.	The second shock at Comorn was accompanied by a subterranean noise, and did great damage, almost all the buildings being shaken, and several thrown down. At Pesth most of the houses were injured or thrown down altogether. A cross on one of the public buildings, and a large iron bar supporting the arms of Hungary were bent, the latter to the extent of 2 feet. Temeswar and Belgrade also suffered considerably. The earth opened, and an odour of sulphur came out. At Schemnitz it was remarked that the earthquake was not felt at all in the mines. A piece of iron was detached from a magnet here. Violent storms were experienced the day before at Vienna, and on the 30th in Bavaria.	Gazette de France, Juillet et Août; Journ. Encycl. Juillet et Août; Annual Register, vol. vi. p. 83.
July 11. 7½ 32 <sup>nd</sup> A.M.	Nîmes in France	A slight shock from W. to E., lasting some seconds.			Gazette de France, 25 et 29 Juillet.
— 12. 7 A.M.	Avignon, Aix and Tarascon.	A very perceptible shock, lasting 5 to 6 seconds.		Accompanied by subterranean noise	Hist. de l'Acad. de Paris, 1763, p. 19; Coll. Acad. t. xvii. (or xiii.) p. 85.

1.	2.	3.	4.	5.	6.
3. July 20. Country round Etna ... — 23. Comorn in Hungary		Another violent shock, raising the total number felt there to 110 or 112.		Followed by an eruption the day after	<i>Journ. Emseyd.</i> 1 Août. <i>Gazette de France</i> , &c. as quoted above.
— 29. Ditto. Also felt, at the same time and with equal violence, at Raab.		Another. Other shocks were felt, from time to time, at Raab, up to the 4th of August.		At Comorn 1500 houses were overthrown, and 300 injured.	Ditto.
— Aug. 9. Raab		Another shock, more violent than any of those felt since the 28th of June.		Houses were thrown down at Raab	Ditto.
— 21. Augusta in Georgia, N. America.		A shock of earthquake At Plymouth (England), on the 19th, about noon, a sudden flux and reflux of the tide, like that at the time of the great Lisbon earthquake, occurred during a tremendous storm of thunder, wind, rain and hail. No earthquake shock mentioned.			<i>Annual Register</i> , vol. vi. p. 96, and for Plymouth, p. 95.
— Sept. 1. One of the Molucca Islands. P.M.		The first shock lasted 4 minutes, followed by seventeen others during the evening and night.	At the time of the first shock the sea fell 5 fathoms, and then rose suddenly, inundating a large tract of land.	At the same time a neighbouring volcano threw out vast quantities of stones, &c., and subterranean noises were heard like the firing of cannon. Great damage was done to the buildings.	Ditto, vol. vii. p. 96.
— 18. In Westrobothnia, Sweden. A.M.		Two feeble shocks, with an interval of half an hour.	On this day the sea rose suddenly at Weymouth to the extent of 10 feet, and fell back as suddenly. No shock spoken of.		<i>Mém. de l'Acad. de Stockholm</i> , 1764, p. 24; <i>Annual Register</i> , vol. vi. p. 99.

1763. Sept. 18. Mühlhorn in Switzer- land. These disturb- ances were principally felt from the valley of the Linth in the can- ton of Glaris, by the valley of the Sernf to Mühlhorn, thence by the Wallensee to the Quintenberg, by the upper Toggeneburg in the district of Wild- haus, and further west through the seignury of Sax.	.....	.....	.....	.....	v. Hoff quotes "Alpina v. Salis u Steinmüller, Th. iii. S. 311."
— Oct. 3. Constantinople .....	.....	.....	.....	.....	Gazette de France, 28 Nov.; Journ. Encycl. 15 Nov.
— About 6 A.M.	.....	.....	.....	.....	Gazette de France, 4 et 11 Nov.
8 <sup>h</sup> 15 <sup>m</sup> A.M.	.....	.....	.....	.....	Ditto, 9 Janv. 1764.
— 30. Philadelphia in N. Ame- rica.	.....	.....	.....	.....	Mém. de l'Acad. de Stockholm, 1764.
— Dec. 16. In Westrobothnia in Sweden.	.....	.....	.....	.....	Gazette de France, 13 Fév.; Journ. Encycl. 15 Fév., 1764.
— 23. Constantinople .....	.....	.....	.....	.....	Thomson's Annals of Philosophy, vol. viii. p. 366.
— About 7 P.M.	.....	.....	.....	.....	Merian quotes Prof. d'Annone.
— Parish of Logierait in Perthshire.	.....	.....	.....	.....	The Gazette de France (20 Fév.) records the fall of a mountain 18 miles from Naples on the 19th Jan. Possibly caused by an earthquake, though none is mentioned.
1764. Jan. 6. Bâle .....	.....	.....	.....	.....	Some time before a shock had been felt at Aleppo.
Feb. 14. Tripolis in Syria .....	.....	.....	.....	.....	Gazette de France et Journ. Encycl. 1 Juin; Phil. Trans. vol. liv. p. 83.
7 <sup>h</sup> 4 <sup>m</sup> P.M.	.....	.....	.....	.....	

1.	2.	3.	4.	5.	6.
1. May 15.	Corœna in East Bothnia, Sweden, and in the adjoining villages.	A slight shock	served in the tides on the forenoon of the 11th Feb., but no shock was felt.		
— 19.	Alzano in Italy, and the surrounding villages.	One shock			Accompanied by a noise like that of a carriage rolling on a pavement.
- June 4.	On the banks of the Ganges (whereabouts is not mentioned, probably near Calcutta).	Several violent shocks.			Ditto, 11 Juin; Journ. Encycl. 1 Juin.
- July 3.	Florence	Two slight shocks			Many houses were overturned, and great numbers of men and cattle were killed.
— 21.	Berbec; S. America	A violent shock of 4 minutes' duration.			Annal Register, vol. viii. p. 98.
- Aug. 16.	Freiberg in Saxony	A violent shock			Gazette de France, 28 Juillet.
- Oct. 12.	In the Azores	One shock, from S.W. to N.E.	On the 18th of this month a disturbance of the waters of Lake Erie was observed. No shock mentioned.		Ditto, 23 Nov.
—	Comorn in Hungary	Some more shocks during this month.			Ditto, 19 Oct.
- — or	In the district of the Lower Elbe.	An earthquake			Annal Register, vol. vii. p. 103; Féruasac, Bull. des Sc. Géol. t. xiii. Mai 1828, p. 130.
- Nov. 6.	At Oxford, and in other parts of Berkshire and Wiltshire.	One shock			Gazette de France, 16 Nov.
A.M.	Peterwaradin in Hungary.	A violent shock			A space of 30 acres was swallowed up, and a lake of 40 fathoms deep formed in its place.
- Dec.					The morning was calm, but, after the shock, the wind became tempestuous.
ht of 2-3.					Some walls were thrown down
ut 11 A.M.					Accompanied by a subterranean noise. The weather was bad, thunder, wind and rain prevailing, but for a moment after the shock a sudden calm took place.

1764. Dec. ...	In the country of the Lower Elbe, and in Saxony.	Violent shocks	.....	Attended with inundations	Journ. Hist. F&V. 1765, p. 147.
1765. Jan. 6.	Comorn and Raab in Hungary.	Slight tremblings	.....	.....	P. Cotte in Mém. Math. et Phys. préf. à l'Acad., &c. t. vii. p. 475; Gazette de France, 11 F&V.
— 13.	Pranden in Austria.	Three slight shocks	.....	Each shock accompanied by a noise like the report of a cannon.	P. Cotte, loc. cit.; Gazette de France, 15 F&V.
— 18.	Sala in the duchy of Parma.	One ditto	.....	.....	Cotte, loc. cit.; Gazette de France, 4 F&V.; Journ. Encycl. 1 F&V.
— Feb. 9.	Along the Irtisch in Siberia, especially at the fortress of Jampchew.	Several violent shocks	.....	Accompanied by a terrible noise	Cotte, loc. cit.; Journ. Hist. Juillet, p. 65.
— 14.	Abbeville in France, especially from the side of Saint-Valery.	A slight shock.	.....	To the north nothing was perceived but a low hollow noise, coming apparently from the sea.	Cotte, loc. cit.; Gazette de France, 8 Mars.
— About the middle of the month.	Pistoia and San Gemini in Italy.	Slight shocks	.....	.....	Gazette de France, 11 Mars.
— March 9.	Antigua in the West Indies.	Violent shocks	.....	.....	Ditto, 14 Juillet.
— 15.	Island of Dominica.	Shocks of more violence than any previously felt in this island.	.....	More than 150 shocks were reckoned here in February and March. They continued up to the 30th June.	Ditto, 15 Juillet.
— 21.	Karlstadt in Werneland, Sweden.	Several shocks.	.....	Accompanied by a noise like that of a carriage.	Ditto, 29 Avril; Journ. Encycl. 15 Avril; Cotte, loc. cit.
— 7 <sup>th</sup> 40 <sup>m</sup> A.M. April 1.	Bermuda.	A shock of earthquake	.....	.....	Annual Register, vol. viii. p. 77.
— 5.	Dominica.	More violent shocks.	.....	.....	Gazette de France, 19 Juillet.
— 8.	Lamoges and the country round.	Three violent shocks.	.....	The two last shocks accompanied by a prolonged noise like thunder.	Ditto, 19 et 21 Avril; Cotte, loc. cit.
— 10 P.M.	Island of Grenada.	Several ditto	.....	.....	Gazette de France, 2 Sept.
— 17.	Florence	A very slight shock.	.....	.....	Ditto, 17 Mai; Cotte, loc. cit.
— 20.	In the afternoon.	.....	.....	.....	.....
— 22.	Genoa	Three shocks, of which the first was rather violent.	.....	.....	Gazette de France, 6 Mai; Journ. Encyl. 1 Mai; Cotte, loc. cit.
— Between 5 and 6 A.M.	.....	.....	.....	.....	.....



1.	2.	3.	4.	5.	6.
May 19. 4 <sup>30</sup> A.M. The country on the French side of the Pyrenees.	In the "pays de Foix" one shock lasting nearly two minutes, followed by two other slighter ones ten or twelve minutes after, and by many others for twenty-four hours. At 11 <sup>h</sup> 15 <sup>m</sup> , one shock lasting three seconds was felt at Toulouse; direction = N. to S.	A rather violent shock		Buildings, furniture, &c. were much shaken and injured. The Journ. Encycl. of the 15th July records an earthquake extending seventeen leagues, in the Pyrenees, on the 15th <i>Joue</i> , at 11 A.M.; but it seems obvious that that of the 19th May is spoken of.	Gazette de France, 31 Mai; Journ. Encycl. 1 Juin; Mém. de l'Acad. de Paris, 1765, p. 23; Coll. Acad. t. xiii. p. 157; Annual Register, vol. viii. p. 89; Cotte, <i>loc. cit.</i>
— 25. (A.M. or t.) Lisbon					Journ. Encycl. 15 Juin.
— Tiano and Mignano near Naples.	Earthquake shocks		At the end of this month the sea suddenly rose 30 feet near Canton in China, and swept away 10,000 of the inhabitants. No earthquake mentioned.	Three houses were thrown down, and two churches much damaged	Two Annual Register, vol. viii. p. 92.
— June 22. Jalas-järvi and Umeå in Eastern Bothnia, Sweden.	Two shocks, lasting about a minute.			The Annual Register says at the end of June. Journ. Encycl. 15 Juin; Annual Register, vol. viii. p. 106.	
— June 22. Rocca, Montepiano in the Abruzzo, Italy.	Some shocks felt, probably very slight.			Felt during tremendous rain. On the 24th an enormous rock fell and overwhelmed part of the village.	Gazette de France, 29 Juillet; Journ. Encycl. 1 Août.
— 24. Chieta in the Abruzzo...	An earthquake			Masses of rock fell, and water burst forth. Probably connected with, if not the same as the last account.	P. Cotte, <i>loc. cit.</i>
— 29. July 14. Trieste Pitea in West Bothnia, Sweden. Also, the same day, at Luleå.	Three shocks At Pitea the shock appeared to come from the west, and			At Pitea the windows were shaken, and at Luleå a subterranean noise was heard.	Gazette de France, 9 Août. Ditto, 26 Août; Journ. Encycl. 1 Sept.; Annual Register, vol. viii. p. 110; Cotte, <i>loc. cit.</i>

1765. July 23. Ditto .....	At Lulea it was very slight, and apparently in the same direction.	The sea ebbed and flowed more than twenty times in a short space to the extent of 3 or 4 feet.	During a terrible storm of thunder, lightning, and rain. The Annual Register gives the date 26th July, as also v. Hoff, quoting Cotte, who places the earthquake at Lackman.	Gazette de France, 28 Oct.; Journ. Encycl. 15 Oct.; Annual Register, <i>loc. cit.</i> ; Cotte, <i>loc. cit.</i>
— Aug. — Agnano in Italy .....	A strong shock	.....	.....	Gazette de France, 9 Sept.
— In an-Batavia in the island of Java.	An earthquake	.....	.....	H. Vogel's Seereisen. Th. 2. S. 151.
— Oct. — Spoleto in Italy .....	Several very energetic shocks.	.....	.....	Gazette de France, 11 Nov.; Journ. Encycl. 15 Nov.
— Nov. 13. Liabon .....	A shock	.....	Cotte ( <i>loc. cit.</i> ) reports several shocks at Liabon on the 13th December. The date must be mistaken for that here given.	Gazette de France, 20 Déc.
1766. Jan. 2. In the Söndmör, Norway.	An earthquake.	.....	The houses, windows, &c. were shaken	Keilhau's Memoir in the Magazin für Naturvidenskaberne, <i>loc. cit.</i>
— — 10. Naples .....	Two slight shocks	.....	.....	<i>loc. cit.</i>
— — 24. In the Söndmör, Norway.	Another earthquake shock.	.....	Ditto	Keilhau, <i>loc. cit.</i>
— Feb. 2. Rhode Island and Massachusetts in N. America.	An earthquake	.....	Accompanied by a remarkable meteor	Silliman's Journal, vol. xxix. p. 336.
— — 10. In Glamorganshire .....	A quaking, tremulous motion, lasting eight seconds.	.....	.....	Annual Register, vol. ix. p. 65.
11½ P.M.	A shock of two minutes' duration.	.....	Articles of furniture were thrown down. The Gentleman's Magazine gives the date 28th January.	Gazette de France, 10 Mars; Gentleman's Magazine, vol. xxvi. p. 150.
— Between 3 and 4 A.M.	A violent shock	.....	.....	Cotte, <i>loc. cit.</i> ; Gazette de France; Mercure de France; Journ. Hist.; Journ. Encycl., &c., at various dates during this year and the next mention the numerous shocks in the West Indies; Mém. de l'Acad. de Paris; Humboldt, &c.
— Mar. 9. Island of Antigua .....	.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
1766 Mar. 28.	About Vesuvius .....	Many violent shocks.	.....	Accompanying an eruption of the volcano .....	Hamilton, Observations on Mount Vesuvius and Mount Etna, London, 1774, p. 5-15; Phil. Trans. vol. lviii. p. 2; Gazette de France, 28 Avril et 16 Juin; Journ. Encycl. 1 Mai.
— April 4.	In Iceland .....	An earthquake .....	.....	Followed on the 5th by an eruption of Hecla, which lasted until the 16th July. Krafie was also in eruption.	v. Hoff.
— — 17.	Island of Grenada .....	A violent shock .....	.....	Accompanying a violent eruption of the volcano.	Cotte, loc. cit.; Gazette de France, &c.
— — 26.	On the south side of Etna.	Violent shocks, followed by others during the following night and day, and at intervals up to the beginning of June.	.....	Accompanying a violent eruption of the volcano.	Ferrara, Descrizione del Etna, p. 124.
— May 22. About 5 <sup>h</sup> 30 <sup>m</sup> A.M.	Constantinople. Several other towns also suffered severely.	Violent shocks from S. to N., continuing uninterruptedly for two minutes. They recurred several times during the day, and indeed were felt almost daily up to the 16th June, and at frequent intervals, to the end of that month. Those of the 10th and 14th were the greatest.	The sea was greatly agitated.	Accompanied by a loud subterranean noise in the same direction as the shocks. The damage done to buildings at Constantinople was valued at eleven millions of piastres. v. Hammer, in his History of the Ottoman Empire, (t. xvi. p. 143 of the French translation, quoted by Ferrey) gives the date 22nd April. This seems to be certainly a mistake.	Gazette de France; Journ. Encycl.; Journ. Hist. Juillet et Août; Cotte, loc. cit.
— June 11. At midnight.	Jamaica, especially at Port Royal. Also in Cuba.	In Jamaica a violent shock lasting 1½ minute. In Cuba it lasted seven minutes, and the shocks recurred up to the 14th.	Ships at sea, a league and a half from the coast of Jamaica, rolled so much that their gunwales were immersed in water.	In Cuba many houses were thrown down, but in Jamaica, though greatly shaken, very few fell. The Annual Register gives the date 9th June, but obviously erroneous.	Annual Register, vol. ix. p. 118; Cotte, loc. cit.; Gazette de France, &c.

1766. July 1.	Constantinople	One shock				Gazette de France; Journ. Hist.; Journ. Encycl.; Juillet et Août.
— 5.	Ditto	Ditto			Accompanied by subterranean noise, and productive of some ruins.	Ditto.
— 8.	Briançon and Mont Dauphin.	Two considerable shocks from N. to S.			Accompanied by noise	Gazette de France, 25 Juillet; Journ. Encycl. 1 Août.
— 14.	Constantinople	Another shock				Ditto, and Journ. Hist. Juillet et Août.
— Night between 14 and 15.	Ditto	Ditto; more violent than any of those in this month.			Accompanied by a loud bellowing noise	Ditto.
— Middle of the month. During the night.	Sto Marie in S. America.	Very violent shocks, followed by slighter ones every day up to the 21st.				Gazette de France; Journ. Hist. &c.
— 24.	Island of Cephalonia	A violent shock, lasting three minutes, and followed by three others the same day. The earth trembled more or less for fifty days.				Journ. Encycl. 1 Sept.; Gazette de France, 19 Déc.
— Aug. 5. 6 <sup>h</sup> 50 <sup>m</sup> A.M.	Vienna, and more violently on the frontiers of Hungary, and at St. Marguerita. Also at Constantinople, in Turkey and Asia Adrianople, Gallipoli, Salonica, Smyrna, Enos, Tenedos, &c., as far as Broussa in Bithynia.	At Vienna and in Hungary two shocks were felt. At Constantinople and other places in Turkey and Asia Minor, one very violent shock (the most so since the 22nd May), which lasted 40 seconds at Constantinople, and was there succeeded by two others at 8 $\frac{1}{2}$ and 10 P.M. From the 5th to the 16th the shocks occurred daily at Constantinople, and were very frequent up to the 23rd.			At Constantinople fresh ruins were produced among the houses and mosques. At Adrianople also houses were thrown down, and the other towns mentioned suffered more or less injury. The Journ. Hist. and Annual Register give the date 8th Aug.	Gazette de France; Journ. Encycl. Août et Sept.; Journ. Hist. &c.
— Half an hour after noon.						

1.	2.	3.	4.	5.	6.
Aug. 6. Padua ..... 30 <sup>m</sup> (Italian time).		One shock .....			Toaldo, Essai Météor. p. 270.
— In the margravate of Ancona.		Several shocks .....			Journ. Encycl. 15 Août.
— 13. Island of Martinique in the West Indies.		An earthquake .....			Gazette de France; Journ. Hist. &c.
— 16. Vienna ..... 25 <sup>m</sup> P.M.		A considerable shock, of five or six seconds' duration.			The Ditto; Annual Register, vol. ix. p. 136.
— 17. Ditto. Also felt at Presburg.		A second, and less violent shock.			Ditto.
— 25. Newport (the capital of Rhode Island) in N. America.		A violent shock, lasting twenty-five seconds.			Gazette de France, 7 Nov.
— Martinique in the West Indies.		Another and very violent shock.			Gazette de France; Journ. Hist. &c.
Sept. 5. Constantinople. All these shocks at Constantinople were scarcely perceptible at Smyrna, but extended to Vienna on the other side.		Another rather considerable shock, followed by eight ones up to the 24th, when they appeared to have ceased for a month.			Gazette de France, 24 Oct. et 17 Nov. Journ. Encycl. 15 Sept. 1 et 15 Oct.
— 18. Guadaloupe in the West Indies.					Gazette de France; Journ. Hist. &c.
— 23. Lyons. Also observed at the château de Fleichères, at la Croix-Rousse, St. Just, and other places in the environs.		A feeble trembling motion.			An extract from the registers of the observatory of Lyons, communicated by M. Aug. Bravais to M. Perrey. Also a communication of M. P. de Lacroix to the same.
— Cuba ..... 1 of the 11th.		An earthquake.....			Annual Register, vol. ix. p. 142.

1766. Aug. From this month until the new year.	Albano in Italy .....	Shocks recurred daily.	.....	M. Perrey says that he can find no account of these shocks in any of the journals of the day.	.....
— Oct. 6.	Island of St. Eustache in the West Indies.	An earthquake.	.....	Accompanied by a hurricane, according to Cotte.	Gazette de France; Journ. Hist. &c.; Cotte, <i>loc. cit.</i>
— 21.	Cumana and Caraccas in New Granada, South America. Also the island of Trinidad, <i>hourly</i> (probably only at first) for 14 months; indeed all the north-eastern portion of S. America.	Very violent shocks. In the territory of Caraccas they recurred <i>hourly</i> (probably only at first) for 14 months; indeed all the north-eastern portion of S. America.	.....	The whole city of Cumana was ruined. Eruptions of sulphurous water frequently occurred, especially about Casanay, two leagues to the east of Coriaco. The inhabitants lived in the streets for the two years, 1766–67. The Indians celebrated by feasts the approaching destruction and subsequent regeneration of the world. During these shocks a little island in the Orinoco sank and disappeared beneath the waters, and in many places disturbances of the surface were produced. The first and third of the shocks at Surinam were attended with subterranean noise, as were the shocks at the mission station of Encarnamado.	Ditto; Humboldt, Voyage, &c. (octavo), t. i. p. 307., t. ii. pp. 23 to 274, t. v. p. 56; Gilli, Saggio di storia Americana, t. ii. p. 6.
3 A.M.					
— 24.	Constantinople .....	Another shock, lasting twenty seconds.	.....		Gazette de France; Journ. Encycl. &c.
7 A.M. Nov. 9.	Ditto .....	Another rather energetic shock.	.....		Gazette de France, 12 et 29 Déc. et 16 Janv. 1767; Journ. Encycl. 15 Janv.; Mercure de France, Fév. 1767.
5 A.M.					Ditto.
— 23.	Ditto .....	Ditto, followed by others up to the 1st December.	.....		
6 A.M.					
— Dec. 12.	Charleston in S. Carolina	A slight shock.	.....	Accompanied by a meteor.	Silliman's Journal, vol. xxxix. p. 336.
5 A.M.	Martinique .....	A violent shock.	.....		Gazette de France; Journ. Hist. &c.
5 A.M.	Portsmouth, and many adjoining places in New Hampshire, N. America.	A violent shock.	.....	Attended by a rumbling noise. The weather very calm and serene. No damage was done.	Annual Register, vol. x. p. 52; Gazette de France, 6 Mars, 1767.
6 <sup>h</sup> 48 <sup>m</sup> P.M.					
(According to the Gazette de France, the 13 <sup>th</sup> , Dec. 1767.)					

1.	2.	3.	4.	5.	6.
Jan. 12. ht be- en 18 19. A.M.	In the Caucasus ..... Constantinople ..... Bielefeld in Westphalia. One shock .....	An earthquake ..... A rather violent shock ..... One shock .....		The spire of a minaret, which was just repaired, was thrown down. ....	Keferstein. Gazette de France, 27 Fév.; Journ. Encyl. 1 Mars. Gazette de France, 9 Fév.; Cotte, <i>loc. cit.</i>
19. A.M.	Hameln (in the basin of. At Hameln, one shock the Weser), and Ha- nover.	At Hameln, one shock but a few instants, and was so slight as to be perceptible only in the upper stories of the houses.		After the shock the wells at Hameln in which there had been no water were suddenly filled. The weather was excessively cold. The An- nual Register gives the date 22nd January for Hanover.	Gazette de France; Journ. Encycl. Févr.
20. A.M.	Lipstadt, Rithberg, At Lipstadt the shock Guterslohe, Ilrfort, was from W. to E., Munster, Osnabruck, and lasted a few and Paderborn. seconds.	Two shocks at Parma at the times men- tioned, each lasting two seconds. They were more violent at Pisa, and had been preceded by some slighter ones.	The ice on the Lippe was cracked in many places.	Doors were burst open at Lipstadt .....	Annual Register, vol. x. p. 50; Ga- zette de France, 6, 16, et 20 Fév.; Journ. Encycl. 15 Fév.
21. 30 <sup>m</sup> and 15 <sup>m</sup> A.M.	Parma. Also at Pisa...	Thirty-six shocks were felt in this space of time.			Gazette de France, 9 et 20 Fév.; Cotte, <i>loc. cit.</i>
reen the and the February.	Finizzano in Tuscany ...	Three successive shocks felt, succeed- ed by slight tremors for some time.		Great damage was done to the buildings .....	Annual Register, vol. x. p. 67.
22. ut the of the 1th.	Genoa ..... Naples, and about Vesu- vius.	Some slight shocks...		In all probability this account, with those of the Ditto. 19th, 20th, and 21st, all refer to the same earthquake, and thus the dates are erroneous. Perrey, however, does not seem to think so. Fire appeared on the summit of Vesuvius on the 1st February.	Gazette de France, 23 Fév.; Hamil- ton.

1767 Jan. 30. 5 <sup>h</sup> 30 <sup>m</sup> P.M.	Constantinople	A violent horizontal shock.	.....	.....	Journ. Encycl. 15 Mars; Gazette de France, 20 Mars.
Night between 31 and Feb. 1.	Kiliar in the province of Dagostan, Caucasus.	Two shocks, the first lasting one minute, the second twenty seconds.	.....	Several people were thrown down by the motion.	Journ. Encycl. 15 Avril.
Feb. 7. About 4 or 5 A.M.	Genoa and Turin, and indeed perceptible all through Lombardy.	At Genoa and Turin some rather violent shocks, lasting 30 seconds.	.....	.....	Gazette de France, 23 Fév., 16 Mars; Annual Register, <i>loc. cit.</i>
.....	Island of Scio	An earthquake.	.....	Probably occurred at the same time with that next mentioned.	Annual Register, <i>loc. cit.</i>
About same day.	Constantinople	A rather violent shock, lasting as long as that of the 30th January. Slight shocks were felt up to the 16th.	.....	.....	Gazette de France, 27 Mars; Journ. Encycl. 1 Avril.
8 A.M.	Grasse in France. Felt also more strongly at Nice, Genoa, and especially at Venice.	Three considerable shocks, of which the first, the most violent one, lasted a few seconds, the others not so long.	.....	During the shock a sound was heard like that of a gust of wind.	Annual Register, vol. x. p. 78; Gazette de France, 9 Mars.
4 A.M. (According to the Annual Register, 4 <sup>h</sup> 15 <sup>m</sup> .)	Naples	A violent shock	.....	The inhabitants quitted the town.	Gentleman's Magazine, vol. xxxvii. Gazette de France, 20 Avril; Journ. Encycl. 15 Avril; Cotte, <i>loc. cit.</i>
Mar. 17.	Comorn in Hungary	Two more shocks	.....	.....	Gazette de France, 11 Mai.
20 <sup>h</sup> 30 <sup>m</sup> A.M.	Constantinople	Another, as violent as the first.	.....	.....	Ditto.
A little after midnight (of the 29th); the April 7. 1 <sup>h</sup> 30 <sup>m</sup> A.M. 2 A.M.	At Bourgneuf (départ. Loire-Inférieure). Also at Nantes.	At Bourgneuf a violent shock. At Nantes the shock was but slight.	.....	Accompanied at Bourgneuf by noise in the direction E.S.E. to W.N.W. Half an hour after a loud clap of thunder where the noise of the earthquake appeared to end. At Nantes the sound was like that of a chariot. There had been a high wind there the evening before.	Ditto, 17 Avril et 15 Mars.



1.	2.	3.	4.	5.	6.
Apr. 13. At Gotha. Also at Cassel, Göttingen, Helmstadt, and Mulhausen. Also the same day, at Rothemburg, and along the Fulda and Werra.		At Gotha two shocks at the hours mentioned, of which the first only was felt at Cassel, Göttingen, &c. At Rothemburg three violent shocks were felt (hour not mentioned).		At the moment of the first shock an oblong sulphurous cloud was observed at Vagelsburg on the side of Cassel. At Sondra (two miles from Gotha) a noise like the report of a cannon was heard. At Rothemburg chimneys were thrown down.	Gaz. de Fr., 1, 8, 25, 29 Mai; Journ. Encycl., 15 Mai; Mercure de France, Octobre; Poggenдорff's Annalen, B. 19. s. 473; Cotte, <i>loc. cit.</i>
15. Gernsheim in Hesse-Darmstadt.		Two smart shocks		Accompanied by a subterranean noise lasting one minute for each. On the 11th the thermometer had suddenly fallen 9° in the evening it was very variable, and at 10 P.M. a violent wind arose, which lasted only five minutes.	Gazette de France, 15 Mai.
20. In different places to the west of Stirling, Scotland.		A slight shock.			Ditto, 22 Mai.
21. Surinam. Also in Martinique and Barbadoes.		At Surinam several shocks, of which two were rather violent. In Martinique also the shocks were violent. One particularly so was felt there about 7 A.M. in the mountains which separate the waters of the Oyapoc from those of the Marony.	At Martinique and Barbadoes the sea was much agitated, and ebbed and flowed in an unusual way.	The Journ. Hist. erroneously gives the date 14th April for Martinique.	Ditto, 17 Juillet, 4 et 21 Sept.; Journ. Hist. Oct. p. 318; Gentleman's Magazine, vol. xxxvii. p. 325.
May 26. In the neighbourhood of Sandomir, Mimorsea, and Latyszew in Poland.		An energetic shock.			Gazette de France, 10 Juillet.
27. Turin and the valley of Lanzo.		At Turin some slight shocks; more violent ones in the valley of Lanzo.		Some buildings were injured in the valley of Lanzo. It was reported that the little hill of S <sup>ta</sup> Christina was seen to reel (chanceler) and smoke. The following day at 5 P.M. two villages of this district were struck by lightning.	Journ. Hist. Août, p. 153.

of the month.	of the year.			
4. About 6 P.M.	Rome. Also at Spoleto. A violent shock. At Spoleto several others were felt.		Houses were thrown down at Spoleto	Gazette de France, 29 Juin; Journ. Encycl. 15 Juin et 1 Juillet; Cotte, <i>loc. cit.</i>
22. 3 <sup>h</sup> 9 <sup>m</sup> A.M.	Cologne and throughout the province of Cleves. Also felt at Sedan and Bouillon.			Gazette de France, 3 et 17 Juillet; Journ. Encycl. 15 Juin (the number did not appear until July according to M. Perrey); Cotte, <i>loc. cit.</i>
July. Night of 14 to 15.	In Upper Calabria. The shocks were felt as far as Gallipoli.	Several violent shocks from W. to E., followed by others up to the 18th.	Great damage done to buildings, &c. Cosenza, Luzzi, Sta Agatha, &c. suffered extremely. Forty persons were killed. An eruption of Vesuvius began on the 7th August.	Annual Register, vol. x. p. 125; Journ. Hist. Sept. p. 230.
End of the month.	Island of Cephalonia	Violent shocks	Sa Maura was much injured	Journ. Encycl. 15 Sept.
Aug. 24. Ditto	Ditto	Ditto	Many of the inhabitants swallowed up, and almost all the buildings ruined. Very probably the last account refers to this event.	Annual Register, vol. x. p. 123.
Sept. 2. Spoleto	Seven more shocks	On the 5th September at between 7 and 8 P.M., the sea at Ostend, and the Liffey at Dublin, ebbed and flowed suddenly and violently to the extent of 4 or 5 feet. No shock is mentioned.	Vesuvius continued in eruption	Journ. Encycl. 1 Oct.; Annual Register, vol. x. p. 126-7.
11. 1 <sup>h</sup> and 5 A.M.	Constantinople	Two slight shocks		Gazette de France, 26 Oct.; Journ. Encycl. 1 Nov.
Night of 22, 23.	In the Söndmör, Norway.	Three considerable shocks in the space of a minute.	Each shock preceded by a noise, which appeared to come from the earth.	Keilhan's Memoir, <i>loc. cit.</i>
26. and 27.	Spoleto	More shocks	On the 28th a hurricane unroofed almost all the houses.	Gazette de France, 26 Oct.; Journ. Encycl. 1 Nov.

1.	2.	3.	4.	5.	6.
Oct. 19. 2.	About Vesuvius, and as far as Naples.	Numerous and violent shocks.		Accompanying a violent eruption of the volcano, which did not entirely cease until the 27th. At Naples explosive noises were heard, and doors and windows opened of themselves. On the 13th and 14th there had been heavy rains.	Gazette de France, 16 Nov.; Journ. Encycl. 15 Nov.; Coll. Acad. t. xiv. p. 79; Journ. Hist. Déc. p. 473; Phil. Trans. vol. lviii. p. 1. vol. lix. p. 18; Hamilton, Observations, &c., pp. 19-44; Hamilton, Campi Flegrei, pp. 22-32. Annual Register, vol. x. p. 142.
— l of the th.	Cephalonia and Zante.	A very violent shock, preceded by others less so.		Montgomery Martin (Hist. of the Brit. Col. vol. v. p. 431.) mentions an earthquake of great violence in Zante during this year, without giving the month or day. He doubtless alludes to this event.	Gazette de France, 28 Déc. Ditto, 18 Déc.; Journ. Encycl. 15 Déc. Ditto.
Nov. 13. — 20. — 21. — 22. 10 <sup>m</sup> P.M.	Constantinople Strassburg in Carinthia. Clagenfurth in Carinthia. Macao in China	A moderate shock A shock of 7 seconds' duration. A rather energetic shock. A trembling motion, which lasted about a minute. Followed by a second, of less violence at 11 <sup>h</sup> 5 <sup>m</sup> , and by a third and pretty strong one at 3 A.M. on the 23rd. Altogether five shocks were reckoned, of which the first was the most violent.	The ships lying in the harbour experienced the motion.	The first shock was strong enough to shake a house violently. A rolling noise and heavy gusts of wind were observed.	Phil. Trans. vol. lix. p. 71.
— 23.	Clagenfurth in Carinthia. Also felt at Gratz, and in Styria.	Two other shocks, less violent than the former.	On the 28th November at 5 A.M., the tide at London ebbed and flowed twice in an hour and a half. No earthquake mentioned.		Gazette de France and Journ. Encycl. loc. cit.; Annual Register, vol. x. p. 151.
Dec. 8.	The island of Poulou Neira, belonging to the Banda group.	An earthquake			Vogel's Seereisen, Th. 2. S. 178.

1768. Jan. 3. ... Between mid- night (of the 2nd) and 1 A.M.	Crick in Northampton- shire, and other places near.	.....	.....	.....	Annual Register, vol. ii. p. 59.
— 21. 6 <sup>h</sup> 30 <sup>m</sup> P.M.	Cap François in St. Do- mingo. ...	At Presburg the inna- tions were con- siderable.	.....	.....	Gazette de France, 27 Mai.
— Feb. 27. 2 <sup>h</sup> 45 <sup>m</sup> A.M.	Vienna. Also at Nen- stadt, Presburg, Bis- choffwerder in Lus- tia, and Freiberg.	At Vienna a rather violent shock from N.E. to S.W., lasting eight seconds. At Presburg the shock was less remarkable, and at Bischoffwer- der and Freiberg it was very slight.	.....	.....	Annual Register, vol. ii. pp. 75 and 85; Gazette de France, 14 et 18 Mai; Journ. Encycl. 15 Mai.
— March 5. 9 <sup>h</sup> 30 <sup>m</sup> A.M.	Vienna and the neigh- bourhood.	.....	.....	.....	Gazette de France; Journ. Encycl. <i>loc. cit.</i>
— 18. (O.S.) 4 A.M.	Irkutak and Selingin in Siberia.	.....	.....	.....	Pallas, Voyage, &c. t. iv. p. 394.
— April 3.	Pan in the Pyrenees ...	A slight trembling ...	.....	.....	Gazette de France, 18 Avril; Cotte, <i>loc. cit.</i>
— 25. — 30.	At L'Orient in France. Naples. Felt more per- ceptibly in several other parts of Italy.	A violent trembling for one minute. An undulatory shock. A slight shock.	.....	.....	Cotte, <i>loc. cit.</i> Gazette de France, 30 Mai, 10 Juin; Cotte, <i>loc. cit.</i>
Between 6 and 7 P.M. — May 4.	Parma .....	Some slight lateral shocks.	.....	.....	Gazette de France, 23 Mai; Cotte, <i>loc. cit.</i>
— 15. 4 <sup>h</sup> 15 <sup>m</sup> P.M.	Newcastle, Manchester, Darlington, Kendal, and some places in Yorkshire.	Two shocks with an interval of half a minute. Direction supposed to be E. to W. One shock lasted nearly two seconds.	.....	.....	Annual Register, vol. xi. p. 114; Cotte, <i>loc. cit.</i> ; Gazette de France, 30 Mai et 6 Juin.
— 19. Beginning of the night. the June 9. — 30 <sup>m</sup> P.M.	Genoa .....	A trembling	.....	.....	Gazette de France, 10 Juin; Journ. Encycl. 15 Juin.
— 30 <sup>m</sup> P.M.	Lisbon .....	Several violent shocks, said to be from N.E. to S.E.	.....	Accompanied by subterranean noise	Gazette de France, 11 Juillet; Journ. Encycl. 15 Juillet; Cotte, <i>loc. cit.</i>

1.	2.	3.	4.	5.	6.
June... try pro- ably same (as last.)	Gibraltar	A violent shock			Gazette de France, 4 Juillet.
Aug. 3. Irkutsk and Selingsinsk. Another slight trem- bling.					Pallas, Voyage, &c. t. iv. p. 394.
S.) 2 P.M. in Siberia.					Rensaudot, Annales Périodiques.
Oct. 5. Constantinople		A trembling			Ditto.
— 12. Ditto		Another slight trem- bling.		Did no damage ..... The Coll. Acad. mentions an earthquake at Con- stantinople in this year, which threw down three of the so-called seven towers. Can it refer to this event?	
— 19. Florence, and the coun- A rather violent try round. Also at Padua.		shock preceded by a slighter one, and followed by a third at 2 A.M. on the 20th.		The district of S <sup>a</sup> Sophia in the Florentine Ro- magna was ruined by this earthquake. The moon was at the full at the time. Cotte gives the date 20th October.	Gazette de France, 18 et 21 Nov.; Journ. Encycl. 15 Nov.; Toaldo, <i>loc. cit.</i> ; Cotte, <i>loc. cit.</i>
Nov. 30. Castel, Fiorentino, Mon- tale, and Gombassi in Italy.		Very smart shocks		Even the sick were brought out into the open country.	Gazette de France, 19 Janv.; Mer- cure de France, Fév. 1769.
Dec. 1. Ditto		More shocks		Ditto.	
— 21. pinning of month. P.M. (day given).	Santa-Sosia in Tuscany.	Two shocks, of which the second was the more violent.		Many houses were thrown down, and the large bridge of the place was split through the mid- dle from end to end.	Annual Register, vol. xi. p. 195.
— 21. Worcester, Gloucester, A violent shock of between 5 many other parts of 16 P.M. England, and in the mountains of Scot- land.				Gloucester cathedral was shaken to its founda- tions.	Annual Register, vol. xi. p. 201; Gazette de France, 13 Janv.; Mercure de France, Fév. 1769.
— 29. Bytown in Hereford- shire.		Apparently from E. to W.		During this year the sea was turbid off the Shetland Isles, and dead fish rose to the surface, phe- nomena ascribed by v. Hoff to submarine volcanic action.	Gentleman's Magazine, vol. xxxix. p. 80; Gaz. et Merc. de Fr. <i>loc. cit.</i> ; Hibbert, Description of the Shetland Isles, p. 390.

1769. Jan. 1. Florence	Violent shocks.	.....	.....	At the time of new moon	Renaudot, Annales Périodiques.
8. Padua	One shock	.....	.....	.....	Toaldo, Essai Météor. loc. cit.
9 o'clock (Italian time).		.....	.....	.....	
Feb. -5. Neustadt near Vienna.	Ditto	.....	.....	.....	Gazette de France, 3 Mars.
24 30 <sup>m</sup> P.M.	A trembling.	.....	.....	Unproductive of damage	Renaudot, Annales Périodiques.
8 <sup>m</sup> 30 <sup>m</sup> A.M.	A violent shock	.....	.....	.....	Gazette de France, 21 Avril; Journ. Encycl. 15 Avril.
Mar. 8. Padua	Another shock.	.....	.....	The moon was in her last quarter.	Toaldo, Essai Météor. loc. cit.
8 o'clock (Italian time).		.....	.....	.....	
May 1. Bagdad	Several shocks.	.....	.....	.....	Journ. Hist. Déc. p. 474; Gazette de France, 3 Nov.; Richard, Hist. des Météores, t. viii. p. 504; Cotte, loc. cit.
2 P.M.		.....	.....	.....	Gazette de France et Journ. Encycl. 15 Août; Cotte, loc. cit.
Aug. 4. Augsburg, Nuremberg, Gunzburg, Ulm and Fiachler.	Violent shocks for seventeen minutes.	.....	.....	The moon was at the full	Toaldo, Essai Météor. loc. cit.
19 <sup>h</sup> 45 <sup>m</sup> (Italian time).	Another shock.	.....	.....	.....	
Oct. 24. Irkutsk (N.S.) 7 P.M.	Two violent shocks from S. to N.	.....	.....	The latter of the two shocks injured some buildings.	Gazette de France, 26 Fév.; Journ. Encycl. 1 Mars, 1770; Pallas, loc. cit.
Nov. Middle of the month.		.....	.....	Several houses were thrown down	Annual Register, vol. xii. p. 155.
4 A.M.		.....	.....	.....	
18. Avignon. More perceptible at two places near Roquemaure and Bedarides.	Violent shocks from S. to N. and N. to S., lasting 1½ minute.	.....	.....	Accompanied by a noise like that of a gust of wind. Followed in a quarter of an hour by extraordinary rain, and the same evening by much thunder and lightning. At Roquemaure and Bedarides houses were overthrown.	Gazette de France, 15 Déc.; Richard, Hist. des Mét. t. viii. p. 505.
Dec. 1. Paris, St. Cloud, Montmorency, Versailles, Elbeuf, Dieppe, Rouen, and Houleme, a village near Rouen.	A violent shock. At Houleme (one league from Rouen) two smart shocks were felt at the hour mentioned.	.....	.....	At Rouen fears were entertained that the houses would fall, while in the neighbourhood the shock was little perceived. At Houleme a brilliant light was observed in the heavens. At Elbeuf, where the shocks were violent, a multitude of shooting stars with brilliant trains were seen.	Hist. de l'Acad. de Paris, 1769. p. 23; Cotte, loc. cit.; Gazette de France, 8 et 15 Déc.; Journ. Encycl. 15 Déc.; Coll. Acad. t. xiv. p. 124; Richard, Hist. des Mét. t. viii. p. 506.
A little after 6½ P.M. (at Versailles). 6½ 36 <sup>m</sup> . 10½ P.M.		.....	.....	.....	

1.	2.	3.	4.	5.	6.
1769.	Island of Zaute .....	A violent shock .....		It is doubtful whether this event is not the same with that of 1767.	Montgom. Martin, <i>loc. cit.</i>
1770, Jan.	Syracuse .....	An earthquake .....		Belfries were injured .....	Kefenstein. Journ. Encycl. 1 Mars.
Beginning of the month.	Messina .....	A violent shock .....			
End of the month.	S <sup>ra</sup> Maura, one of the Grecian islands.	A violent earthquake.		Seven hundred houses were destroyed, and many of the inhabitants buried under the ruins.	Annual Register, vol. xiii. p. 69; Journ. Encycl. 5 Fév.
— Feb. ...	In Calabria, at Reggio, and also in Sicily.	An earthquake.			Phil. Trans. vol. lxxiii. p. 196.
— Mar. 20. Bale.		A trembling.			Merian quotes the Meteorological Register of d'Annone. Renaudot, Annales Périodiques.
— May 26. Lisbon.		One shock .....		Followed by a subterranean noise .....	Annual Register, vol. xiii. p. 130; Vivenzo (1788), p. 22; Humboldt, Voyage, t. ii. p. 285; Cotte, <i>loc. cit.</i> ; Essai sur l'Hist. Nat. de l'Isle de St. Domingo, Paris, 1776; Gazette de France, 3 et 10 Août; Journ. Encycl. Août; Mercure de France, Sept.; Renaudot, Ann. Périod.; Richard, Hist. des Mét. t. ix. p. 419; Journal des Mines, No. 18. pp. 49 et 54.
— June 3. In the western part of St. Domingo, especially at Port-au-Prince.		A violent earthquake: The first shock (at 7 <sup>h</sup> 3 <sup>m</sup> ) was from E. to W., and lasted 3 minutes. The other shocks (which continued at Port-au-Prince for four hours) were in all the various directions of the compass. The most severe lasted 2½ minutes. Only four were felt at Cape Nicola Mole. The shocks were felt in the other parts of the island but feebly, but at Port-au-Prince they continued almost uninterrupted until the 5th.	The sea inundated the country to the distance of a league and a half from the shore.	All the buildings at Port-au-Prince and many other places were destroyed. A river was completely choked up in one place, and in another a small volcano made its appearance. A noise like that of a cannon fired amongst hills was heard. Immediately before the shock a water barometer fell 2½ inches = 2 lines of the mercurial barometer. Great clefias opened in the earth in various places, from which mephitic vapours came and produced an epidemic. Hot springs also appeared, but ceased to flow after some time. On the 6th a violent hurricane occurred at Charleston.	

1770, June 3. to 23.	Shocks at Reggio Calabria, Messina, Arpino, Sora, Peperno, and several other places in the Terra-di-Lavoro.	Shocks at Reggio almost daily during this period. At Messina 30 shocks in a space of eight days. In the Terra-di-Lavoro but one shock.	Gazette de France, 30 Juillet; Journ. Encycl. 1 et 15 Août; Renaudot, Ann. Périod.
— 9. 10 <sup>h</sup> 58 <sup>m</sup> 45 <sup>s</sup> (A.M. or P.M.?) 11.	At Cologne. Also felt at Maestricht.	Reiterated shocks for fourteen to sixteen seconds at Cologne. At Maestricht but one shock.	Gazette de France, 25 Juin.
— July 22. Messina	Bellev, Bourg, Lyons, Mont d'Or, Geneva, and Grenoble.	Two or three shocks of thirty seconds, in two parallel directions from E. to W.	Annual Register, vol. xiii. p. 145. Gazette de France, 17 Août; Register of the Observatory of Lyons, communicated to M. Perrey by M. Aug. Bravais. Communication of M. P. Lacroix to the same; Cotte, <i>loc. cit.</i> Gazette de France, 8 Oct.
— Aug. 14.	Constantinople	Two shocks from N. to S. (Renaudot, Ann. Périod. gives the opposite direction.)	Register of the Observatory of Lyons, communicated to M. Perrey by M. Aug. Bravais.
— Oct. 9. 7 <sup>h</sup> 15 <sup>m</sup> A.M.	Lyons, la Claire, Bal-mont, and Ambérieux (Bugey).	More slight shocks, less perceptible at Lyons than at the other places mentioned.	Cotte, <i>loc. cit.</i> Gazette de France, 30 Nov.; Journ. Encycl. 1 Déc.
— — — — — Day not mentioned.	Bâle Sora in the Terra-di-Lavoro, Italy.	A trembling Several shocks.	
— 30.	In the Voigtland, Saxony; at Plauen and the adjoining villages, Adorf and its territory, Brunebach, Schomberg, Egra.	Numerous shocks from the 25th September to the 10th November, the most violent being those of the date here given.	Gazette de France, 21 et 28 Déc., 4 Fév.; Journ. Hist.; Fév. 1771; Journ. Encycl. 15 Dec.



1.	2.	3.	4.	5.	6.
Nov. 3. Schomberg in the same region. A.M.	The shocks recurred after an interval of quiet, and continued almost all the rest of the day. At 10 P.M. they became more violent.	Accompanied by a subterranean noise, which, with the shocks, became more violent at 10 P.M. Some persons were crushed in attempting to escape from a church.			Gazette de France, 21 et 28 Déc., 4 Fév.; Journ. Hist. Fév. 1771; Journ. Encycl. 13 Déc.
— Plauen in the same region. A.M.	The shocks recurred here also, followed by others at 4 A.M. on the 5th.	Accompanied by a dull noise like that of a heavily laden carriage.			Ditto.
— Johann-Georgenstadt in Saxony also. Dec. 6. Lintz on the Danube	An earthquake rather energetic shock.	Followed by storms which did not cease for more than a month.			Ditto.
— 27. Florence between midnight (of the ?) and A.M.	A violent shock, followed by some others less considerable.	Some houses and villas were thrown down			Gazette de France, 28 Déc.; Journ. Encycl. 1 Janv. 1771. Gazette de France, 25 et 28 Janv.; Journ. Encycl. 15 Janv. 1771.
— Sienna in Tuscany not mentioned; in all probability the case as at Florence.	A trembling				Merian quotes d'Annone's Meteorological Register.
At sea, on board a vessel which had left Lisbon the day before. Jan. 4. Johann-Georgenstadt A.M.	Lasted two or three minutes. A violent shock, followed by two others in the space of a quarter of an hour. Another shock	The cannon were shaken			Férussac, Bull. des Sc. Nat. t. ix. p. 21. Gazette de France, 4 Fév.
— 5. Ditto A.M.					Ditto.
— 8. Leghorn A.M.	The first of a series of violent shocks, which lasted until the 25th of this	The inhabitants were much alarmed, the churches were kept open night and day, and all the theatres were closed.			Ditto, 8 Fév.; extract from the Manuscript Journal of Leghorn, of Bernardo Frato, t. i. p. 171 (communicated by Signor Pilla)

1771. Jan. 12.	District of Belluna in the Venetian territory.	month. One on this day, at 4 <sup>h</sup> 15 <sup>m</sup> A.M., was very violent.	Several shocks.	to M. Perrey); Cotte, <i>loc. cit.</i>
— 15.	Leghorn	The two most violent shocks of the period occurred on this day. The motion of the earth was felt, though feebly, until the 20th March.	Part of a mountain rolled down, being detached by these shocks.	Gazette de France, 18 Fév.; Journ. Encycl. 15 Fév.; Cotte, <i>loc. cit.</i> Bernardo Prato's Journal, <i>loc. cit.</i>
— 28.	Albe (in Italy)	Daily shocks during this period, some of them very violent.	The shocks occurred in all states of the barometer, which varied $\frac{1}{2}$ or $\frac{1}{4}$ in. during the time.	Vassali-Eandi, Rapport, <i>loc. cit.</i> p. 128.
— April 20.	Luçon in the Philippine Isles.	An earthquake	Did great damage, especially at Hermita near Manila.	Aragon, Descripc. Geogr. y Topogr. de la Yala de Luçon, Manila, 1819, t. ii. p. 19.
— Feb. 1...	Luçon in the Philippine Isles.	One shock	Did some damage to St. Pierre, Fort-Royal, and in various houses.	Gazette de France, 6 Mai; Journ. Encycl. 1 Mai.
— During the first half of the month.	Martinique	One shock		
— 17.	Island of Vulcano (one of the Lipari group).	The island was violently shaken.		Ferrara, Campi Flegrei, pp. 233 and 234.
— 18.	Schlangenbergh. Semenovskoi, Kouznetzkoï, and over the whole extent of the Altai chain. Not felt beyond Schlangenbergh.	A rolling motion from S. to N., but feeble at Schlangenbergh. At Semenovskoi, however, it was very violent.	The day before, the barometer fell half an inch, and the wind blew strongly from the south all night. Snow fell in the morning, and very cold weather set in, which lasted until the 3rd of March. At Semenovskoi the shock was felt as well in the mines as on the surface. At Schlangenbergh it was not perceived in the mines.	Pallas, Voyage, &c.; Trad. de Gauthier de la Feyronie, t. iii. p. 342.
(O. S.) 8 A.M.				
— Mar. 20.	Florence	A slight shock.		Gazette de France, 19 Avril; Cotte, <i>loc. cit.</i>
— 9 P.M.	Ditto	Ditto		Ditto.
— 21.	Ditto	Ditto		Toaldo, <i>loc. cit.</i>
— 5 A.M.	Padua	One shock		
— April 3.				
— 7 A.M.				
— 7 o'clock.				
— (1st day of the year)				
— 29.	Abingdon in Berkshire	A momentary, but rather violent shock.	Persons felt themselves lifted up, and saw the pavement move. There was a very little wind from the east.	Annual Register, vol. xiv. p. 100.
— 5 P.M.				

1.	2.	3.	4.	5.	6.
June ... July ... of the thorbe- ing of ust.	Velletri and the environs Scilly Isles	Rather energetic shocks. A violent shock			Gazette de France et Journ. Encycl. 15 Juillet. Gazette de France, 23 Août; Journ. Encycl. 15 Août.
28. Irkutsk, and at Ver- chanskoi (9 wersts from Irkutsk), in the villages above Irkutsk, in the Ostrog of Bal- ganskoi (distant 184 wersts), at Selinginsk, and Kinkta (91 wersts from Selinginsk).		Two shocks, the first of which was feeble, and the second very violent, although scarcely felt in some localities. At Selin- ginsk a similar order was observed. At the other places the motion was slight. The shocks were from N. to S. (ac- cording to Pallas, the opposite), lasted 10 secs., and were more violent to the south of Irkutsk. A slight shock.	The Angora exhibited a species of flux and reflux.	The weather was very calm, and the wind westerly, in which direction it remained until the 30th.	Pallas, <i>loc. cit.</i> t. iv. p. 394; Gazette de France, 9 Déc. 1771 et 9 Mars 1772.
Aug. 6. Leghorn				v. Hoff, quoting Cotte, gives the date 7th August	Gazette de France, 6 Sept.; Cotte, <i>loc. cit.</i>
7. The Ostrog of Tounki- skinskol in Siberia.		A violent shock. This year is stated to have been most re- markable for the violence of the earthquakes in Cen- tral Asia.		Chimneys were thrown down. It is very remark- able that the previous shocks were not felt in this district. Pallas concludes that the centre of disturbance of the Altai chain is situated in the mountains of Zaissan-Noor. See general observations on this district in Pallas, <i>loc. cit.</i> ; Gmelin in Prévost, Hist. Gén. des Voyages, t. xviii. pp. 214 and 401, and t. xix. p. 340; Humboldt's Asie Centrale, t. ii. p. 110; and Erman, Reise, Th. II. s. 179-184.	Pallas, <i>loc. cit.</i> t. iv. p. 394; Gazette de France, 9 Déc. 1771, 9 Mars 1772.
8. Smyrna		A violent shock			Journ. Encycl. 15 Oct.
11. At Memmingen, Dur- lach, Stuttgart, Schaff-		Violent shocks		Service was interrupted in the churches; the priests left the altar.	Gazette de France, 9 et 11 Oct.

hausen, in the environs of Augsburg, over a space of 60 leagues long and 40 wide, to the banks of the Rhine.	Violent shocks				Followed by a storm	Ditto, 23 Sept. et 11 Oct.; Journ. Encycl. 1 Oct.; Merc. de Fr. Oct.
1771. Aug. 13. At Castiglione, and in the territories of Mantua, Ferrara, and Modena.	A very energetic shock				A mountain was thrown down and the debris covered several villages (!). A great quantity of water came from a cleft in the ground.	Ditto.
2 A.M.					Accompanied by a subterranean noise	Journ. Encycl. 15 Sept.
17. Cagliari, and at the islands of St. Pierre, Tenedos, and Neutri.	Several shocks during 40 seconds.					Gentleman's Magazine, vol. xl. p. 422; Gazette de France, 23 Sept.; Merc. de Fr. Oct.
2 P.M.						Gazette de France, 19 Oct.
24. Astbury in Cheshire	Lasted about 3 sec.					Ditto, 18 Déc. 1771; Journ. Encycl. 1 Janv. 1772.
4 A.M.						Dausy's Memoir, loc. cit.
Island of St. Eustache in the West Indies.	A violent shock				Followed by a terrible storm	Gazette de France, 8 Nov.
Sept. 3. Jamaica	A violent shock, lasting 30 seconds.				Did much damage	Ditto, 27 Déc.; Journ. Encycl. 1 Janv. 1772.
8 A.M.					Felt on board the vessels in port.	Gazette de France, 16 Déc.
Oct. 3. At sea 0° 42' S. lat., and 22° 47' W. long.	A trembling kind of shock.				Felt on board the frigate "le Pacifique," Capt. Bonilla, from the Gold Coast for St. Domingo.	Ditto, 24 Janv. 1772.
8 P.M.					No bottom was found on sounding.	Keferstein mentions this event without giving the month.
Barcelona in Spain	Violent shocks from E. to W. for 5 or 6 seconds.					Gazette de France, 16 Déc.
9 <sup>h</sup> 30 <sup>m</sup> P.M.	Fresh violent shocks.					Ditto, 24 Janv. 1772.
3 St. Domingo	Violent shocks again for 5 or 6 seconds.					Keilhan's Memoir, loc. cit.
Nov. 7. Barcelona	A shock from E. to W.					
7 <sup>h</sup> 15 <sup>m</sup> P.M.	Nice, Sospel, Monaco, and Menton in Italy.					
30 <sup>m</sup> A.M.	Several little shocks, for the most part from S.E. to N.W.					
1 <sup>st</sup> Dec. 10.						
In the Söndmör, Norway.						
At night.						

1.	2.	3.	4.	5.	6.
1771 .....	Island of Java.....	Several shocks .....	.....	The surface of the ground was upheaved in several places.	Raffles, History of Java, vol. ii. p. 234, and Appendix, p. 7. Gazette de France, 24 Janv.
1772. Jan. 2. Parthenay (department of Deux-Sèvres) in France. Between 6 and 7 A.M.	.....	A violent shock .....	.....	Furniture was thrown down .....	.....
7 A.M.	9. Ditto .....	Ditto, followed by a very slight one at 9 A.M.	.....	Buildings were thrown down. Accompanied by a noise like that of carriages.	Ditto.
7 and 9 A.M.	Poitiers .....	Two rather violent shocks.	.....	.....	Ditto.
7 P.M.	Feb. 18. In the neighbourhood of Kola, Russian Land.	An earthquake lasting about a minute, in the direction N. to S.	.....	Preceded by a noise like that of a carriage upon pavement. The houses were shaken, and tiles fell from the roofs. The weather was cloudy and stormy all day. During the disturbance a quantity of snow fell, accompanied by a high wind.	Journ. Encycl. 1 Mai.
Mar. 8. About noon.	Brétignolles near Chinon (depart. Indreet Loire) in France.	Two shocks, in a vertical direction.	.....	Accompanied by a low noise like a prolonged explosion.	Mém. de l'Acad. de Paris, 1772, p. 15; Coll. Acad. t. xv. p. 23.
3 o'clock (Italian time).	10. Padua .....	One shock .....	.....	.....	Toaldo, loc. cit.
April 5. Midnight.	Lisbon .....	Two violent shocks, of which the second and more violent lasted two minutes. The vibration appeared to be horizontal, from S. to N. This shock was also felt at 12 <sup>h</sup> 6 <sup>m</sup> at Cadix, St <sup>a</sup> Maria, San-diz, Lucar-de-Barameda, &c.	.....	The weather was calm and serene, and the sky clear. Before the shocks the dogs howled and cocks crew in a melancholy manner. Then there were heard subterranean noises, with whistling sounds as if in a storm. These noises lasted as long as the shocks. Very little damage was done. Pendulums were stopped by the motion.	Annual Register, vol. xv. p. 89; Gazette de France, 4 et 8 Mai; Journ. Encycl. 1 et 15 Mai; Journ. Hist. Juin, p. 473.
Between mid-night and 1 A.M. (of the 8th or 9th?).	8. Ditto .....	A less violent shock, but lasting a long time. From S. to N. as before.	.....	.....	Gazette de France, &c. loc. cit.

Apr. 10. Lisbon .....	Another, more violent, but not so quick; also from S. to N. From the 6th to the 22nd shocks were felt daily in Algiers.			Gazette de France, &c. <i>loc. cit.</i>
— 18. Algiers .....	Three heavy shocks at the hours mentioned.			Gazette de France, 1 Juin.
5 P.M.				
— 19. Josselin in Bretagne .....	A shock from N.E. to S.W., lasting 3 secs.		Most violent in the mountains, at <i>selkénf angles</i> .	Ditto, 25 Mai.
— 20. Genoa .....	A shock of but short duration.			Ditto, 18 Mai.
hit between 26 and 27.				
— 30. Constantinople .....	Two shocks; the first slight, the second more violent.			Journ. Encycl. 15 Juin.
June 8. Clausayes (department Drôme) in Dauphiny.	A slight trembling, followed, at 5 P.M., by three very distinct shocks.			Faujas de Saint-Fond, Hist. Nat. du Dauphiné, t. i. p. 320; Rozier, Obs. sur la Phys.
— 9. Ditto. Felt also in the neighbourhood.	Several shocks.			Ditto.
— 11. Ditto .....	Fresh and violent shocks. Slight ones were felt at intervals throughout June, the direction of which was then W. to E.		During the whole month of June subterranean noises, like a distant cannonade, were heard at intervals. In July, August, September and October nothing was felt or heard.	
— 16. Padua .....	A shock .....			Toaldo, <i>loc. cit.</i>
15 <sup>th</sup> (Italian time).				
— 24. Puy (France) and the country round.	A rather violent shock, lasting 2 secs., followed by others of violence at 11 A.M., lasting 1 second.		The first shock was accompanied by a noise like that of a carriage. The second set were felt in the "subdélégation de Saint-Bonnet-le-château, généralité de Lyon."	Gazette de France, 6 et 24 Juillet; Journ. Encycl. 1 Juillet.

1.	2.	3.	4.	5.	6.
1772. July 31. 2 <sup>h</sup> 41 <sup>m</sup> P.M.	La Rochelle in France.	A slight shock from S. to N. It was believed that another shock had been felt at 11½ A.M.		Accompanied by a noise resembling that of a carriage rolling rapidly.	Gazette de France, 24 Août; Merc. de Fr. Sept.
— Sept. 13.	In the Tyrol	An earthquake		The earthquake brought down immense masses of ice from the mountains, which so choked up the rivers as to produce the most terrible inundations, many towns and villages being nearly submerged, and a mountain in one place being completely underent by the water.	Journ. Hist. Déc. p. 467.
— Oct. 31.	Padua	One shock			Toaldo, <i>loc. cit.</i>
23rd hour (or 1st Nov. at 11 A.M.)	In the mountains of Béarn (Pyrenees).	An earthquake.		The village of Arudi was especially injured	Palassou, Mémoires, &c. p. 266.
— Nov. 1	Claussayes in Dauphiny	Slight tremblings from time to time during this period.		Accompanied by subterranean noise.	Faujas de Saint-Fond, <i>loc. cit.</i> p. 321.
— 29.	Ditto	A brief, sharp shock. Followed by slight ones at intervals up to the 6th Jan. 1773.		The attendant noise was heard almost daily up to the 6th January.	Ditto.
— Dec. 23.	Havre and the neighbourhood.	A shock of two seconds duration.		Accompanied by subterranean noise	Gazette de France, 1 Janv. 1773.
6 <sup>h</sup> 37 <sup>m</sup> P.M.	Prades (Roussillon) in France.	An earthquake.		Accompanied by a low noise, apparently coming from the west.	Gazette de France, 18 Janv.; Merc. de Fr. Fév. 1773.
11½ P.M.	In the Beschtan mountains in the Caucasus.	An earthquake.		A portion of Mount Metschuhh was severed from the rest, and fell into a chasm in the earth. On the 12th August of this year there was a great eruption of the volcano Tegal in Java and (in this year also) eruptions occurred from Hecla, and the volcano Awatschinskaja in Kamchatka.	Pallas, Reise in die südl. Statthaltschaften des Russ. Reiches. Th. 1. s. 347; Huet. Géol. t. i. p. 112.
1773. Begin- ning of the year.	At old Fez in Morocco.	A considerable earthquake.		Many houses were thrown down. This event is possibly only the same with that of the 12th April (see below), though it seems hardly usual to call April the beginning of the year.	Gazette de France, 3 Mai.

1773, Jan. 12, 4 A.M. (According to the Annual Register, vol. xvi. p. 75; Gazette de France, 8 Fév.)	Comorn in Hungary ...	Several violent shocks, in a direction between N. and E.	The Danube rose to a great height, inundating the town, and drowning many of the inhabitants.	Accompanied by a low noise. The Gazette de France observes that no year had passed since 1763 without a shock being felt in this district.	Annual Register, vol. xvi. p. 75; Gazette de France, 8 Fév.
— 16, 4 P.M.	Claussayes in Dauphiny	Two violent shakes. The earth was often agitated during the following night.			Faujas de Saint-Fond, <i>loc. cit.</i> p. 321; Gazette de France, 12 et 22 Fév.; Journ. Encycl. 1 Avril; Merc. de Fr. Mars.
— 18, About 7 A.M.	Ditto	A violent shock, followed, in an hour and a half, by four others of great violence. Other slight ones were felt during the day, and a very great one at 8½ P.M.		The second set of shocks detached many stones from the walls. They were accompanied by a fresh, brisk breeze, which only lasted as long as the noise and shocks. These and all the other disturbances were attended with subterranean noise.	Ditto.
— 19, 20, 21 and 22, 4 P.M.	Ditto	Many feeble shocks.		Accompanied by noise	Ditto.
— 23, 4 P.M.	Ditto. Also at Suze, Valréas, La Garde, Pierrelatte, Montelimar, &c., and even beyond the Rhone, in the direction of St. Andréol and Viviers.	The three most violent shocks hitherto felt.		Great damage was done. At Tulette (3 leagues from Claussayes) some saucers suspended by very long threads oscillated in a remarkable manner, as if attracted and repelled by each other, the motion ceasing suddenly and at once like that of the earth, but after the latter in point of time.	Ditto.
— 24, 26, 27, 28, and 29, between 28 and 28.	Claussayes	Many slight tremblings.		Accompanied by noise	Ditto.
— 25, and 29, Night and 28, 27 and 28.	Semlin and Belgrade ...	Three shocks in the space of one minute.		The walls were cracked in a terrible manner	Gazette de France, 8 Mars; Journ. Encycl. Avril.
— 26, 27, 28, and 29, Night and 28, 27 and 28.	St. Savin (Poitou) in France.	Several shocks		Followed by a storm of such violence that houses were thrown down and trees torn up by the roots over a space of more than three leagues.	Gazette de France, 19 Fév.



1.	2.	3.	4.	5.	6.
1773. Jan. ... Night between 30 and 31.	Claussayes again. ....	Several shocks; one of them terrible.		The noise, on this occasion, occurred at the same time with the agitation of the earth.	Faujas de Saint-Fond, &c. <i>loc. cit.</i>
11 — 31. 11 A.M.	Ditto .....	Another shock, less considerable			Ditto.
— Feb. 1. 2 and 3.	Ditto .....	Several moderate shocks.		Three of the shocks were much more perceptible in the farms lying N. to W.	Ditto.
— 4½ A.M.	2. Saint-Jean-Pied-de-Port	Two shocks, lasting more than two min.			Gazette de France, <i>loc. cit.</i>
— 4 A.M.	4. Claussayes .....	A violent agitation ...			
— 2 P.M.	7. Ditto .....	Another shock, nearly as violent as that of the 23rd Jan., but lasting at most only 4 secs. The direc- tion of the shocks from their com- mencement to this day was uniformly E. to W. They were sharp, unequal, ho- rizontal oscillations. Slight shocks con- tinued up to the 15th.		Felt strongly at the farms spoken of above, Faujas de Saint-Fond, &c. <i>loc. cit.</i> though but slightly at the village. The point from which these shocks seemed to come was a little hill, known as the "Sault de la pierre," about seventy toises in height, and situated not more than a thousand yards from the village. A trembling like that produced by carriages on pavement was felt, and at the occurrence of all the considerable shocks a "tourbillon" of wind was remarked, which stopped the progress of both men and animals, terrifying the latter.	
— 15. 11½ A.M.	Ditto .....	A very short, but vio- lent shock, followed by slight ones up to the 22nd.		The motion became feebler at Claussayes, but Ditto. increased to the S.W. The noise alone was often heard at the former place, while the agi- tation of the ground was quite sensible at Saint-Raphaël, a village at the distance of a league.	
— 22. Between 8 and 9 A.M.	Ditto .....	Three violent shocks.		Accompanied by a surprisingly loud noise .....	Ditto.
— 24. same hour.	Ditto .....	Ditto .....		Walls were thrown down .....	Ditto.
— 25.	Ditto, and Saint-Raphaël	Slight disturbance at Claussayes, the			Ditto.

shocks becoming, however, violent at Saint-Raphaël. From this until the 1st June the former was generally at rest, and only suffered slight shocks at intervals, while at the latter the disturbance became very violent, and extended to a part of the territory of Clausayes hitherto spared.	Mar. 24. In the Söndmör, Norway.	Mar. 24. In the Söndmör, Norway.	shocks becoming, however, violent at Saint-Raphaël. From this until the 1st June the former was generally at rest, and only suffered slight shocks at intervals, while at the latter the disturbance became very violent, and extended to a part of the territory of Clausayes hitherto spared.
April 1. Ragusa.	April 1. Ragusa.	April 1. Ragusa.	April 1. Ragusa.
— 12. Cadiz, Rota, S <sup>ta</sup> Maria, Port Royal, at the Clancane, Lisbon, &c. Also at Madrid, Malaga and Gibraltar, and at Salee and Tangiers on the coast of Africa.	— 12. Cadiz, Rota, S <sup>ta</sup> Maria, Port Royal, at the Clancane, Lisbon, &c. Also at Madrid, Malaga and Gibraltar, and at Salee and Tangiers on the coast of Africa.	— 12. Cadiz, Rota, S <sup>ta</sup> Maria, Port Royal, at the Clancane, Lisbon, &c. Also at Madrid, Malaga and Gibraltar, and at Salee and Tangiers on the coast of Africa.	— 12. Cadiz, Rota, S <sup>ta</sup> Maria, Port Royal, at the Clancane, Lisbon, &c. Also at Madrid, Malaga and Gibraltar, and at Salee and Tangiers on the coast of Africa.
At Cadiz the shocks were violent from E <sub>s</sub> to W. for two minutes. At Lisbon several shocks were felt, lasting five or six seconds, the last one being the most violent, and the direction E. to N.W. At Malaga they lasted one minute. At Salee but one shock was remarked. It was from E.S.E. to W.N.W., lasting 46 seconds. At Tangiers the direction was E. to W.	At Cadiz the shocks were violent from E <sub>s</sub> to W. for two minutes. At Lisbon several shocks were felt, lasting five or six seconds, the last one being the most violent, and the direction E. to N.W. At Malaga they lasted one minute. At Salee but one shock was remarked. It was from E.S.E. to W.N.W., lasting 46 seconds. At Tangiers the direction was E. to W.	At Cadiz the shocks were violent from E <sub>s</sub> to W. for two minutes. At Lisbon several shocks were felt, lasting five or six seconds, the last one being the most violent, and the direction E. to N.W. At Malaga they lasted one minute. At Salee but one shock was remarked. It was from E.S.E. to W.N.W., lasting 46 seconds. At Tangiers the direction was E. to W.	At Cadiz the shocks were violent from E <sub>s</sub> to W. for two minutes. At Lisbon several shocks were felt, lasting five or six seconds, the last one being the most violent, and the direction E. to N.W. At Malaga they lasted one minute. At Salee but one shock was remarked. It was from E.S.E. to W.N.W., lasting 46 seconds. At Tangiers the direction was E. to W.
Accompanied by a subterranean noise	Accompanied by a subterranean noise	Accompanied by a subterranean noise	Accompanied by a subterranean noise
The pendulums of the observatory at Cadiz were stopped, which gave the exact time of the phenomenon. At Lisbon the air was calm, and no subterranean noise was heard. Tangiers was almost completely ruined. Numbers of houses were thrown down and people injured. The Annual Register mentions two shocks at Madrid and Cadiz on the 13th at 5 A.M., but it seems pretty certain that it must refer to the morning of the 12th.	The pendulums of the observatory at Cadiz were stopped, which gave the exact time of the phenomenon. At Lisbon the air was calm, and no subterranean noise was heard. Tangiers was almost completely ruined. Numbers of houses were thrown down and people injured. The Annual Register mentions two shocks at Madrid and Cadiz on the 13th at 5 A.M., but it seems pretty certain that it must refer to the morning of the 12th.	The pendulums of the observatory at Cadiz were stopped, which gave the exact time of the phenomenon. At Lisbon the air was calm, and no subterranean noise was heard. Tangiers was almost completely ruined. Numbers of houses were thrown down and people injured. The Annual Register mentions two shocks at Madrid and Cadiz on the 13th at 5 A.M., but it seems pretty certain that it must refer to the morning of the 12th.	The pendulums of the observatory at Cadiz were stopped, which gave the exact time of the phenomenon. At Lisbon the air was calm, and no subterranean noise was heard. Tangiers was almost completely ruined. Numbers of houses were thrown down and people injured. The Annual Register mentions two shocks at Madrid and Cadiz on the 13th at 5 A.M., but it seems pretty certain that it must refer to the morning of the 12th.
Keilhan, <i>loc. cit.</i>	Keilhan, <i>loc. cit.</i>	Keilhan, <i>loc. cit.</i>	Keilhan, <i>loc. cit.</i>
Gazette de France, 18 Juin; Journ. Hist. Août, p. 147.	Gazette de France, 18 Juin; Journ. Hist. Août, p. 147.	Gazette de France, 18 Juin; Journ. Hist. Août, p. 147.	Gazette de France, 18 Juin; Journ. Hist. Août, p. 147.
Gazette de France, 7 Mai, 2 et 16 Juillet; Journ. Hist. Juin, p. 474-5; Journ. Encycl. Juin et Août; Annual Register, vol. xvi. p. 100-101.	Gazette de France, 7 Mai, 2 et 16 Juillet; Journ. Hist. Juin, p. 474-5; Journ. Encycl. Juin et Août; Annual Register, vol. xvi. p. 100-101.	Gazette de France, 7 Mai, 2 et 16 Juillet; Journ. Hist. Juin, p. 474-5; Journ. Encycl. Juin et Août; Annual Register, vol. xvi. p. 100-101.	Gazette de France, 7 Mai, 2 et 16 Juillet; Journ. Hist. Juin, p. 474-5; Journ. Encycl. Juin et Août; Annual Register, vol. xvi. p. 100-101.

1.	2.	3.	4.	5.	6
1773. Apr. 15. Between noon and 1 P.M.	St. Malo. Also in Guernsey and Jersey. Also felt on the coast of Dorsetshire.	At St. Malo a shock of a minute's duration from N.W. to S.E. In Guernsey one was felt at 1½ P.M., one in Guernsey and Jersey at 2½ P.M., and another in Guernsey at 4 A.M. the following morning.		Accompanied by a noise like a cart rolling over a stone pavement. At Poole in Dorsetshire things were thrown off the shelves by the shock. Pendulums were stopped at St. Malo.	Annual Register, vol. xvi. p. 95; Gazette de France, 30 Avril, 7, 10, 17, 21 et 31 Mai.
2 P.M.	Plénueuf in the diocese of St. Brieuc. Also felt at Dol.	One shock, in the direction N.W. to S.E.		Accompanied by a noise like prolonged thunder.	Gazette de France, <i>loc. cit.</i>
and 18.	On the south-west coast of Spain.	Several shocks			Annual Register, vol. xvi. p. 101.
11½ P.M.	23. Plénueuf again. Also all the country of Coten-tin, at Dol, and in the island of Jersey.	Another shock in the same direction.		Ditto. Both shocks were felt most severely in the low lands.	Gazette de France, <i>loc. cit.</i>
8 <sup>h</sup> 30 <sup>m</sup> A.M.	30. Cornou in Hungary	A shock of more violence than that of the 28th June 1763. It was in the direction S. to N.E., and lasting ten seconds.		No damage done, notwithstanding the severity of the shock. A noise like thunder was heard at the time. The weather was calm and serene, but some days before heavy wind and rain had been experienced.	Ditto, 24 Mai; Journ. Encycl. Juin.
	Frascati in Italy	Several shocks of considerable violence.			Gazette de France, 17 Mai.
May 6. 10 A.M.	Algiers, Tangiers, and the north coast of Africa.	About twenty shocks. The tremulous motion between the shocks lasted from six to seven seconds to half a minute.	At Algiers the sea rose 5 feet 10 inches in every fourteen minutes, and then fell so low as to leave the boats aground. This decreased from noon until four the next morning. At Tangiers the sea rose 30 feet perpendicularly.	The earthquake consisted of a succession of tremblings and violent shocks. At Tangiers the fountains stopped, and at last there gushed out a black water having a bituminous taste.	Annual Register, vol. xvi. p. 105.

6 A.M. (Nearly at the same time with the last).	Corfu .....	An earthquake .....	The third part of the island was ruined .....	Hist. Août, p. 147. Gazette de France, 2 Juillet, quoting "la Rubrique d'Italie" of the 25th May; Merc. de Fr. Juillet.
June 1. 2½ P.M.	1. Claussayes again .....	A terrible shock, nothing more being felt during this month.	Unaccompanied by noise, though from 4 A.M. to midday a subterranean noise was heard, and again on the following day, when no shock was felt.	Faujas de Saint-Fond, <i>loc. cit.</i> p. 327.
— — —	3. Guatemala .....	The earthquake lasted five days.	The lake inundated its shores.	Berghaus, Allgemeine Lander und Volker-Kunde, Th. 6. S. 448; Borowaki, Abriss einer Naturgeschichte des Elementarreichs, pl. 82; Gazette de France, 27 Juin, 1774; Journ. Encycl. Pév. 1774; Annual Register, vol. xvi. p. 149; Vivenzio, <i>loc. cit.</i> p. 22. Faujas de Saint-Fond, <i>loc. cit.</i>
July 7. In the morning.	7. In the western part of the territory of Claussayes.	Three more very severe shocks. From this day until the 13th October very little disturbance was felt at Claussayes, but very heavy shocks occurred from time to time at Saint Raphaël. Violent shocks recurred.	Scarcely felt in the village.	
— — — 29, or 31. 4 P.M.	Guatemala again .....		Still later (the exact date not given) another earthquake completed the damage done before, and the city was afterwards rebuilt (for the third time) four leagues to the west of its former site. From Haot (Géologie, t. i. p. 112) giving the 29th June as the date of 45,000 people perishing by an earthquake in America, without specifying the place, it is possible that this event occurred at Guatemala at the end of June, not July.	Berghaus, &c., as above, <i>loc. cit.</i>
Aug. 4½ P.M.	8. Luxemburg; extending as far as Vienna, though but slight at the latter place.	A severe shock .....		Gazette de France, 27 Août.



<p>shocks and shock</p>	<p>The third part of the island was ruined</p>	<p>Furneaux. Gazette de France, 16 Juillet; Journ. Hist. Août, p. 147. Gazette de France, 2 Juillet, quoting "la Rubrique d'Italie" of the 25th May; Merc. de Fr. Juillet.</p>
<p>The lake inundated its shores.</p>	<p>Unaccompanied by noise, though from 4 A.M. to midday a subterranean noise was heard, and again on the following day, when no shock was felt.</p>	<p>Faujas de Saint-Fond, <i>loc. cit.</i> p. 327.</p>
<p>The lake inundated its shores.</p>	<p>Two neighbouring volcanoes gave signs of action. From the one torrents of hot water, and from the other lava flowed. The earth opened, and the disturbance was accompanied by thunder, lightning, and rain. On the 7th the earth opened in huge chasms, and swallowed up the city of St. Jago with 5000 (or 8000) families.</p>	<p>Berghaus, Allgemeine Lander und Volker-Kunde; Th. 6. S. 448; Borowski, Abriss einer Naturgeschichte des Elementarreichs, pl. 82; Gazette de France, 27 Juin, 1774; Journ. Encycl. Fév. 1774; Annual Register, vol. xvi. p. 143; Vivenzio, <i>loc. cit.</i> p. 22. Faujas de Saint-Fond, <i>loc. cit.</i></p>
<p>more very severe shocks. From this day until the 13th October very little disturbance was felt at Clausayes, but very heavy shocks occurred from time to time at Saint Raphael. Violent shocks recurred.</p>	<p>Still later (the exact date not given) another earthquake completed the damage done before, and the city was afterwards rebuilt (for the third time) four leagues to the west of its former site. From Hoot (Géologie, t. i. p. 112) giving the 29th June as the date of 45,000 people perishing by an earthquake in America, without specifying the place, it is possible that this event occurred at Guatemala at the end of June, not July.</p>	<p>Berghaus, &amp;c., as above, <i>loc. cit.</i></p>
<p>Guatemala again</p>	<p>A severe shock</p>	<p>Gazette de France, 27 Août.</p>
<p>July 7. In the morning. In the territory of Clausayes.</p>	<p>Aug. 8. Luxembourg; extending as far as Vienna, though but slight at the latter place.</p>	

1.	2.	3.	4.	5.	6.
1773. Sep. 16. In the valley of Ossau beginning of the in the Pyrenees. Month. (Day not given.) About 10 P.M.		One shock		Felt very slightly at the Castle of Espalangué which stands upon chalk rocks, while at the houses of the warm baths, built upon granite, the shock was very severe.	Palassou (who was actually at the Castle of Espalangué at the time), <i>loc. cit.</i>
— 13. Bergen, Winger, and A trembling move- throughout a great ment. part of Norway.				At Winger two terrible storms and the earth- quake were experienced on the same day. The whole was accompanied by subterranean and whistling noises, and the fall of a torrent of rain.	Gazette de France, 26 Nov.; Viven- zio (1783), p. 46.
— 24. Lisbon		A violent shock			Gazette de France, 5 Nov.
8 <sup>h</sup> 30 <sup>m</sup> P.M. — Oct. 13. Claussayes again		Three violent shocks. The motion was ver- tical and followed the direction S. to N.		One of the shocks was followed by a consider- able noise.	Faujas de Saint-Fond, <i>loc. cit.</i> p. 328.
4 P.M. — 15. Ditto		Three slight shocks			Ditto.
10 <sup>h</sup> 4 A.M. — 17. Pau, Gant, and Arudi, in the Pyrenees.		Two shocks from S. to N.E.			Gazette de France, 5 Nov.; Journ. Encycl. Janv. 1774.
5 <sup>h</sup> 4 A.M. — 18. Ditto		Another shock			Ditto.
5 A.M. — 19. Ditto		Ditto			Ditto.
6 A.M. — 22. Ditto		Ditto			Ditto.
— Nov. 25. Claussayes again		Some slight shocks, followed by others, gradually decrea- sing until the end of December, when they had altogether ceased. At St. Ra- phael, however, the shocks continued violently all this month, after which calm reigned there		Accompanied by noise. These villages were almost completely ruined by the long series of shocks to which they were exposed, especially Claussayes, it being situated on the top of a mountain, the base of which consisted of a loose mixture of sand and clay.	Faujas de Saint-Fond, <i>loc. cit.</i>

an. 15. M.	Copiapó in Chili	An earthquake	Three (according to the Annual Register, two) shocks, lasting thirty-five to forty seconds. Direction = <i>N.W. to S.W.</i>	According to Kefenstein this earthquake occurred on the 29th July, the day of the second set of shocks at Guatemala. The weather was quite calm	Basil Hall, Journal written on the coast of Chili, vol. ii. p. 25; Kefenstein. Gazette de France, 4 et 21 Fév.; Merc. de Fr. Mars; Annual Register, vol. xvii. p. 92.
— 26 and	Ratibor in Silesia	An earthquake		The tower of a church was thrown down	Gazette de France, 11 Mars.
— 7. P.M.	Martinique	One shock			Ditto, 10 Juin.
— 22 and	Parma	A slight trembling			Ditto, 25 Mars; Vivensio (1783), p. 47.
— 4. hour.	Ditto	More shocks of considerable violence, in the direction S. to N., and lasting one minute. Several more were felt during the night.		Preceded by a loud subterranean noise. Chimneys and walls were thrown down.	Gazette de France, <i>loc. cit.</i>
— 31. hour.	Padua	A single shock			Toaldo, <i>loc. cit.</i>
— 12. April	Ditto	Another shock			Ditto.
— 17. time).	Berne	Rather a violent shock			Annual Register, vol. xvii. p. 122.
— 17. light. Before	Cayenne	Violent shocks			Gazette de France, 26 Août, quoting a letter from London, dated Aug. 6.
— 1. Aug.	Altdorf and Stirenzen in Switzerland.	At Altdorf and Stirenzen there were shocks at 3, 9, and 11 A.M., 4 P.M., and		The steeple of the church at Altdorf was split through, and many houses were thrown down. Great masses of rock were shaken from the surrounding hills. The earth continued in	Annual Register, vol. xvii. p. 166; Gazette de France, 18 Nov.; De Saussure, Voyages dans les Alpes, t. iv. p. 112.



1.	2.	3.	4.	5.	6.
Sep. 16.—In the valley of Ossau One shock of the in the Pyrenees. th. (Day given.) at 10 P.M.				Felt very slightly at the Castle of Espalangué which stands upon chalk rocks, while at the houses of the warm baths, built upon granite, the shock was very severe.	Palassou (who was actually at the Castle of Espalangué at the time), <i>loc. cit.</i>
— 13. Bergen, Winger, and A trembling movement throughout a great part of Norway.				At Winger two terrible storms and the earthquake were experienced on the same day. The whole was accompanied by subterranean and whistling noises, and the fall of a torrent of rain.	Gazette de France, 26 Nov.; Vivenzio (1783), p. 46.
— 21. Lisbon 10 <sup>th</sup> P.M.		A violent shock			Gazette de France, 5 Nov.
Oct. 13. Claussayes again M.		Three violent shocks. The motion was vertical, and followed the direction S. to N.		One of the shocks was followed by a considerable noise.	Faujas de Saint-Fond, <i>loc. cit.</i> p. 328.
— 15. Ditto M.		Three slight shocks.			Ditto.
— 17. Pau, Gant, and Arudi, in the Pyrenees. A.M.		Two shocks from S. to N.E.			Gazette de France, 5 Nov.; Journ. Encycl. Janv. 1774.
— 18. Ditto A.M.		Another shock.			Ditto.
— 19. Ditto M.		Ditto			Ditto.
— 22. Ditto M.		Ditto			Ditto.
Nov. 25. Claussayes again		Some slight shocks, followed by others, gradually decreasing until the end of December, when they had altogether ceased. At St. Raphaël, however, the shocks continued violently all this month, after which calm reigned there also.		Accompanied by noise. These villages were almost completely ruined by the long series of shocks to which they were exposed, especially Claussayes, it being situated on the top of a mountain, the base of which consisted of a loose mixture of sand and clay.	Faujas de Saint-Fond, <i>loc. cit.</i>

1½ A.M.	neighbouring villages.	from N. to S.			
	Copiapo in Chili .....	An earthquake .....		According to Kefenstein this earthquake occurred on the 29th July, the day of the second set of shocks at Guatemala.	Basil Hall, Journal written on the coast of Chili, vol. ii. p. 25; Kefenstein.
1774. Jan. 15. 1½ P.M.	Vienna, Neustadt, Presburg, and many places in Hungary.	Three (according to the Annual Register, two) shocks, lasting thirty-five to forty seconds. Direction = N.W. to S.W.		The weather was quite calm .....	Gazette de France, 4 et 21 Fév.; Merc. de Fr. Mars; Annual Register, vol. xvii. p. 92.
Night between 26 and 27.	Ratibor in Silesia .....	An earthquake .....		The tower of a church was thrown down .....	Gazette de France, 11 Mars.
Feb. 7. 6½ 30" P.M.	Martinique .....	One shock .....			Ditto, 10 Juin.
Night between 22 and 23.	Parma .....	A slight trembling .....			Ditto, 25 Mars; Vivenzio (1783), p. 47.
Mar. 4. 19th hour.	Ditto .....	More shocks of considerable violence, in the direction S. to N., and lasting one minute. Several more were felt during the night.		Preceded by a loud subterranean noise. Chimneys and walls were thrown down.	Gazette de France, loc. cit.
31. 23rd hour.	Padua .....	A single shock .....			Toaldo, loc. cit.
April 12. 2½ 5" (Italian time).	Ditto .....	Another shock .....			Ditto.
Jan 17. Midnight.	Berne .....	Rather a violent shock.			Annual Register, vol. xvii. p. 122.
Before Aug. the 6th 10. 4 P.M.	Cayenne .....	Violent shocks .....			Gazette de France, 26 Août, quoting a letter from London, dated Aug. 6.
	Altdorf and Stirenzen in Switzerland.	At Altdorf and Stirenzen there were shocks at 3, 9, and 11 A.M., 4 P.M., and		The steeple of the church at Altdorf was split through, and many houses were thrown down. Great masses of rock were shaken from the surrounding hills. The earth continued in	Annual Register, vol. xvii. p. 166; Gazette de France, 18 Nov.; De Saussure, Voyages dans les Alpes, t. iv. p. 112.

1.	2.	3.	4.	5.	6.
Sept. 10. A.M.	Strasbourg, Belfort, Besançon, Beaune (or Beaune-les-Dames?), and Bâle. Also slightly at Ratisbon and Anspach.	the next day at midnight and 3 A.M.; altogether six violent shocks, and other slighter ones. Several shocks from W. to E. At Belfort three occurred in the space of 4 mins. At Beaune a violent shock lasting about half a minute.	On the 24th of this month the sea ebbed and flowed three times in an hour to the extent of 2 feet in perpendicular height, both at Malaga and Leghorn. No earthquake shock mentioned.	agitation for some time.	Gazette de France, 23 (or 27) Sept., 7 Oct.; d'Annoué's Meteorological Register.
15. hour in time).	Padua	Another shock			Toaldo, <i>loc. cit.</i> ; Annual Register, vol. xvii. p. 160.
Oct. 22. — 27. hour in time).	Comorn in Hungary Padua	One shock Another shock			Gazette de France, 16 Déc. Toaldo, <i>loc. cit.</i>
29. M.	In the prefecture of Hanger, and at Bergen in Norway.	Several shocks		Many houses were shaken by the motion	Gazette de France, 20 Fév. 1775.
Nov. 29. M.	Kongsberg and Egersund in Norway.	A shock of 1½ minutes duration.		Buildings were shaken	Ditto, 30 Déc.
Jan. 4. M.	Parma	Several shocks			Gazette de France, 27 Janv.; Journ. Encycl. Fév.
5 P.M.	Padua	Ditto			Toaldo, <i>loc. cit.</i>
5. minutes 11 A.M.	Genoa	One shock, followed by another at 7½ P.M.			Gazette de France, and Journ. Encycl. <i>loc. cit.</i> ; Cotte, Tableau Chronologique. &c. in Journal de



1.	2.	3.	4.	5.	6.
1775. Sept. 5 (or Oct. 8).	Island of Ternate	An earthquake		Granada or Massaya near the lake of Nicaragua. Possibly this account of the earthquake is merely that of two years before.	Vivenzio (1783), p. 47.
About 9 <sup>h</sup> 45 <sup>m</sup> P.M.	Downing in Shropshire, Bristol, Bath, and Swansea.	Tremblings, in the direction E. to W.		Accompanied by noise	Phil. Trans. vol. lx. p. 368, and vol. lxxi. p. 193.
Oct. 6. 7 <sup>h</sup> 33 <sup>m</sup> P.M.	Vico in Corsica	A shock of considerable violence.			Gazette de France, 20 Nov.; Cotte, <i>loc. cit.</i>
16. Malaga		A shock of 3 or 4 secs. duration.		Accompanied by a violent gust of wind from the N.W.	Gazette de France, 24 Nov.; Cotte, <i>loc. cit.</i>
22. Vico in Corsica again		Four more shocks from S.E. to S.W.		A noise like the explosion of a mine was heard. One house was thrown down.	Gazette de France, 20 Nov.; Cotte, <i>loc. cit.</i>
2 <sup>h</sup> 12 <sup>m</sup> A.M.	Tournon in the Vivarais.	A trembling		Accompanied by a heavy gust of wind	Cotte, <i>loc. cit.</i>
Dec. 26. 6th hour (Italian time).	Padua	One shock			Toulido, <i>loc. cit.</i>
30. At Toulouse, and many other places in France, Corbeil, Mortagne, Segré, Alençon, Havre, Caen, St. Lo, Falaise.		At Toulouse a slight shock from E. to W. At Corbeil a gentle undulatory motion from N.W. to S.E. At Alençon, two shocks, the first the most severe, and lasting half a minute. At Mortagne 3 shocks in a vertical direction, each more violent than the preceding. At Havre a slight shock from W. to E. lasting five seconds. At Caen three severe shocks, lasting five or six seconds, and	At St. Lo and Falaise vessels at sea felt the shocks, but the waters of the Orne were not agitated.	At Alençon the first shock was accompanied by a noise like the rolling of a carriage. A well of 45 feet deep had its waters made turbid and blackish. At Segré (Maine-et-Loire) the streams which ran from S.W. to N.E. appeared to boil, while those running in the opposite direction were not affected. The villages in valleys not overlooked by mountains to the S.E. experienced hardly anything. At Caen the noise preceded the shocks, seemed to come from the S.W., and lasted two or three seconds. Another noise was heard <i>after</i> the shocks. Chinnneys and some houses were thrown down. The shock of the 1st January threw down a house at Hérouville.	Gazette de France, 5, 8, 12, 19 et 29 Janv., 9 Fév. et 27 Mars, 1776; Cotte, <i>loc. cit.</i>

1775. ....	In Iceland .....	to N.E. A slight trembling succeed- ed them. At St. Lo and Falaise they were still more vio- lent. A fourth shock was felt at 11 A.M. and a fifth on the 1st January.	.....	.....	v. Hoff. Cotte, <i>loc. cit.</i>
1776. Jan. 30.	At Brest, and Landernau in Bretagne.	An undulatory shock.	.....	.....	Ditto.
—	In the Spanish part of St. Domingo.	An earthquake .....	.....	Accompanied by igneous meteors .....	Jameson's Journal, vol. xxii. p. 302.
— Feb. 2.	Rhode Island, N. Ame- rica.	Ditto .....	.....	.....	Cotte, <i>loc. cit.</i>
—	7. Irkutak in Siberia .....	Ditto .....	.....	An earthquake is mentioned by the Gazette de France, at the island of Thörn near Assens, on the 20th. It refers in all probability to this event.	Ditto.
—	10. The little Danish island of Thorø near Fünen.	A trembling .....	.....	.....	.....
—	27. Malta .....	A shock which lasted at least a minute. The motion was horizontal, from S. to N.	.....	The dome of the cathedral was split by the shock, as in 1742.	Gazette de France, 12 Avril; Cotte, <i>loc. cit.</i>
—	0 <sup>h</sup> 15 <sup>m</sup> A.M.	.....	.....	.....	Cotte, <i>loc. cit.</i>
—	April 14. In Poitou, at la Rochelle, and in the island of Oleron.	Several shocks .....	.....	.....	Dupetit-Thouars, <i>loc. cit.</i> t. ii. p. 213.
—	21. Acapulco .....	An earthquake .....	.....	The greater part of the city was ruined .....	Ditto; Gazette de France, 14 Juin.
—	22. Fiume and Trieste. Also at Bukkari.	A violent shock; most severe at Bukkari.	.....	At Bukkari the walls of a salt warehouse were split through. On the 28th March Veauvius, and on the 27th April Etna was in eruption.	.....
—	5 <sup>h</sup> 36 <sup>m</sup> A.M.	.....	.....	.....	Gazette de France, 10 Mai; Cotte, <i>loc. cit.</i> ; Palassou, <i>loc. cit.</i>
—	24. Perpignan .....	Two shocks .....	.....	.....	Cotte, <i>loc. cit.</i> ; Palassou, <i>loc. cit.</i>
—	1 A.M.	.....	.....	.....	.....
—	30. In Poitou, at la Rochelle, and in the island of Oleron. On the same day at la Barthe de Neste in the Pyrenees.	More shocks .....	.....	Cotte mentions an earthquake in this region of the Pyrenees on the 30th April 1775. One account or the other is probably erroneous.	.....
—	June 1. Island of Ternate .....	An earthquake .....	.....	.....	Cotte, <i>loc. cit.</i>

1.	2.	3.	4.	5.	6.
1776, June 6. Gibraltar 5 A.M.		One shock, lasting about fifty seconds.	Felt on board the ships in the harbour as well as on shore.		Cotte, <i>loc. cit.</i> ; Annual Register.
July 10. Trieste. Also felt at Loubiano (Laybach), from W. to E. The first 5 <sup>h</sup> 40 <sup>m</sup> or 45 <sup>m</sup> P.M.		At Trieste three shocks, the first slight, and the second and the third a little stronger. One shock.		In the Frioul many houses were thrown down. v. Hoff (quoting Cotte) gives the date 10th June.	Gazette de France, 19 Août; Cotte, <i>loc. cit.</i>
11. Padua 9 <sup>h</sup> 15 <sup>m</sup> A.M.		One shock.			Toaldo, <i>loc. cit.</i>
Aug. 4. Carcassonne (département de l'Aude), France.		A severe shock.			Cotte, <i>loc. cit.</i>
20. Cap François, St. Domingo.		Several shocks.		Caused great damage.	Ditto.
Sept. 6. Guadeloupe Oct. 28. Northampton. Less violent at Harborough, Loughborough, &c. in Leicestershire.		An earthquake. A sudden shock, lasting about two seconds.		Accompanied by a violent hurricane. Accompanied by a noise like the jolting of a cart. The windows shook during the shock, and a ball or balls of fire were observed in the heavens. v. Hoff, quoting Cotte, gives the date Oct. 20. Attended with a rumbling noise. The day was gloomy and perfectly calm, wind south, barometer at 29.8 in. and thermometer in the shade 37° 3. Some china on a chest of drawers was moved an inch or two. Furniture was also moved, at Dover bells were made to sound, and at Calais leaves were thrown off the shelves in the bakers' shops. v. Hoff, quoting Cotte, gives the date Nov. 24, 8½ A.M.	Ditto. Annual Register, vol. xix. p. 187; Cotte, <i>loc. cit.</i>
Nov. 27. Canterbury, Sandwich, Ashford, Dover, and all the coast of Kent. Also at Calais.		From S. to N., lasting about eight seconds. At Calais the direction was N. to S.			Annual Register, vol. xix. p. 193; Gazette de France, 9 Déc; Cotte, <i>loc. cit.</i>
28. Mannheim 3 <sup>h</sup> 15 <sup>m</sup> A.M.		Two violent shocks, of which one lasted a minute and some seconds, and the other a minute. Direction N.W. to S.E.		The houses were cracked and bells sounded of themselves. At the observatory the shock was supposed to be vertical, as a plumb-line of 10 feet in length was not moved, and a compass needle of 1 foot long deviated but 3'. The air was calm. A shock is mentioned at 8 <sup>h</sup> 10 <sup>m</sup> A.M. of this day at Calais, Dunkirk, and Dover: but it obviously refers to the	Gazette de France, 9 Déc. et 27 Janv. suiv.; v. Hoff; Cotte, <i>loc. cit.</i>

1776. Nov. ...	In S. Carolina, North America.	An earthquake			Jameson's Journal, vol. xxxi. p. 302.
Dec. 19.	Spire	A trembling			Cotte, <i>loc. cit.</i>
— 24.	Hernösand in Finland (Norway?)	Ditto			Ditto.
—	Worms, Mannheim, and the neighbourhood of Mayence.	Direction = N.W. to S.E., lasting fifteen seconds.			Annual Register, vol. xix. p. 203.
End of the month.				This account probably arises merely from confounding those of the 28th Nov. and 19th Dec.; but from the details given it seems worth insertion.	
—	Inverness	An earthquake felt here during this year.			Thomson's Annals of Philosophy, vol. viii. p. 366.
—	From the neighbourhood of Lake Baikal as far as the Altai, Kolyvan.	An earthquake			Humboldt, <i>Asie Centrale</i> , t. ii. p. 112.
1777. Jan. 19.	Leghorn and Tivoli.	Ditto			v. Hoff.
— Feb 7.	Lucerne, in the canton of Unterwalden, and in the environs. Perceived at Aarberg, Anet (Berne), Neuchâtel, and Neufchâtel.	A rather violent shock; the earth appearing to be raised without any oscillations.		At Sarnen some chimneys were thrown down.	Journal Helvétique, Avril 1777.
— Mar. 5.	Spezin and along the Genoese coast.	A violent shock			Gazette de France, 31 Mars; Cotte, <i>loc. cit.</i>
— April.	Cremble-Point near Turryburn, Scotland.	An earthquake			Gazette de France, 14 Avril.
Beginning of the month, or even before.				Accompanying the sudden sinking of several acres of land beneath which were mines. A noise like thunder was heard at the time. Probably the shock was due solely to the landslip.	
— May 18	In Hungary	Trembling movements during this time.			Cotte, <i>loc. cit.</i>
— June 6.	Naples, and, more slightly, at Rome. Also felt in Sicily, La Puglia and Calabria.	Some other shocks had been felt up to the day before.		Many houses were thrown down in La Puglia, Calabria, and Sicily.	Gazette de France, 14 et 25 Juillet, 11 Août; Cotte, <i>loc. cit.</i>
— 7 <sup>th</sup> 55 <sup>m</sup> A.M.	Pau (in the Pyrenees) and the surrounding district, as far as the boundaries of Comminges and the Pays de Foix.	A violent shock		The date given is 1772, but v. Hoff says it is obviously intended to be 1777 or even 1778.	Palasson, <i>loc. cit.</i> p. 266.



1.	2.	3.	4.	5.	6.
1777. June 7. Padua .....	One shock .....	.....	.....	.....	Toaldo, <i>loc. cit.</i>
8 <sup>h</sup> 15 <sup>m</sup> A.M. — 8. Nax in the Pyrenees .....	Two shocks .....	.....	.....	.....	Palassou, <i>loc. cit.</i>
3 A.M. — July 4. Malaga .....	2 consecutive shocks, lasting 8 to 10 secs. in the direction N. to S.	.....	.....	.....	Gazette de France, 8 Août; Cotte, <i>loc. cit.</i>
5 <sup>h</sup> 33 <sup>m</sup> P.M. — 6. Messina .....	A single shock .....	.....	.....	.....	Cotte, <i>loc. cit.</i>
— 28. Comorn in Hungary .....	An earthquake .....	.....	.....	.....	v. Hoff.
— Aug. 5. In some parts of Tus. Tremblings .....	Tremblings .....	.....	.....	.....	Cotte, <i>loc. cit.</i>
— 13. Village of Brion in the A very violent shock in the direction E.S.E. to W.N.W.	.....	.....	.....	.....	Palassou, <i>loc. cit.</i>
About 10 P.M. — 19. Sola, Isola, and Veroli in the States of the Church. Also at Florence. .....	Very smart shocks .....	.....	.....	.....	Gazette de France, 19 Sept.; Cotte, <i>loc. cit.</i> ; v. Hoff.
— Sept. 2. Island of St. Thomas in the West Indies. .....	Two violent shocks, each lasting a minute. The following day, towards evening, three more shocks were felt. .....	.....	.....	.....	Gazette de France, 2 Fév. 1778; Cotte.
1 <sup>h</sup> 30 <sup>m</sup> P.M. — 14. Manchester. Also, though with less violence, at Lancaster, Liverpool, Birmingham, Derby, Chester, York, Gainsborough, over a space of 130 or 140 miles in diameter. .....	Three violent shocks in the space of half a minute. Direction = S.W. to N.E. .....	.....	.....	.....	Phil. Trans. vol. lxviii. p. 221; Annual Register, vol. xx. p. 78.
10 <sup>h</sup> 55 <sup>m</sup> A.M. — 30. Macaluba near Girgenti, Sicily. .....	Several shocks .....	.....	.....	.....	Dolomieu, Voyage, &c. p. 160; Ferrara, Campi Flegrei, p. 43.
Half an hour after the rising of the sun. — Oct. 1. Lisbon, more violent at the castle of Cintra. .....	Smart shocks .....	.....	.....	.....	Gazette de France, 17 Nov.; Cotte.
6 A.M. —	.....	.....	.....	.....	.....

1777. Oct. 1. Kinsale in Ireland ..... Hour not given.	An earthquake.				Cotte, <i>loc. cit.</i>
— 5. In the territory of Sicily. Toward evening.	Violent shocks			Houses were thrown down at Radicofani. Clefts opened in the ground.	Gazette de France, 24 Nov.; Cotte.
— 16. Florence. Also at Lucca.	An earthquake			Occurred in the midst of a violent storm	Cotte, <i>loc. cit.</i> ; Annual Register.
— 21. La Guayra and Cumana. 1 A.M.	Ditto			In consequence of this earthquake an annual nocturnal procession was instituted. v. Hoff gives the date 1778.	Humboldt, Voyage, &c. t. v. p. 5.
— Nov. 14. Sundval in Sweden, and the environs. 5½ P.M.	A violent shock, lasting 1½ minute.			Accompanied by a low noise, in the direction N.E. to S.W. Several claps of thunder were heard after the shock.	Gazette de France, 5 Janv. 1778; Cotte.
— Dec. Carthage in Spain	Several shocks			Succeeded by a sudden reflux of the sea, which caused the river flowing through the town to inundate its banks.	
1778. Jan. 18. Hermannstadt in Transylvania, and on the borders of Moldavia and Wallachia.	Shocks for half an hour.			The weather was unusually cold for the climate. A church at Cronstadt, on the frontiers of Moldavia and Wallachia, was thrown down. Many persons who were in it perished.	Gazette de France, 9 Fév. 1778.
— 19. Leghorn and Tivoli. About 9½ A.M. and 9 P.M.	Two slight shocks				Ditto.
— In Rome	A slight shock.				Gazette de France, <i>loc. cit.</i>
— Feb. 18. Uffian-Caldio in Tuscany	Some shocks, followed for half an hour by a less perceptible oscillatory motion. A trembling motion.				Ditto, 30 Mars; Cotte.
— April 2. Mannheim	Rather a slight shock				Cotte, <i>loc. cit.</i> ; Bertholon, Électricité des Météores, t. i. p. 291.
— 20. Parma	Rather a smart shock				Gazette de France, 5 Juin; Cotte.
— 30. Guastalla					Gazette de France, 8 Juin.
— 4½ 15 <sup>m</sup> (A.M. or P.M.?). May 5. Aleppo	An earthquake.			Accompanied by unusual cold	Ditto, 10 Août et 11 Sept.; Cotte.
— 5½ 10 <sup>m</sup> A.M.					

1.	2.	3.	4.	5.	6.
1778, May 10. Tief-Hartmannsdorf, in the government district of Liegnitz, circle of Schönan, Silesia.		A trembling.			<i>Econom. Nachrichten der Gesellschaft in Schlesien</i> , B. 6. s. 180.
— 22. Augsburg.		A heavy shock.			<i>Gazette de France</i> , 12 Juin; <i>Cotte</i> .
3 <sup>h</sup> 30 <sup>m</sup> A.M.					<i>Ditto</i> .
— 25. Ulm.		Another shock.			<i>Gazette de France</i> , 7 Août; <i>Cotte</i> .
Between noon and 1 P.M.	June 7. Grenada in Spain. Also on this day at Pau and other places in the Pyrenees, and as far as Bordeaux.	At Grenada a very severe shock, lasting some seconds.			
— 11. At Padua.	Also, on the same day, at Forlì in the Romagna.		On the 25th of this month an extraordinary motion of the sea was observed at Malta. No shock is mentioned.		<i>Toaldo, loc. cit.</i> ; <i>Cotte</i> .
— 16. Smyrna.		A very violent earthquake. Slight shocks occurred daily up to the 3rd July.		Many buildings were thrown down.	<i>Annual Register</i> , vol. xxi. p. 193; <i>Gazette de France</i> , 14 Sept.; <i>Cotte</i> .
— 18. Béon, in the valley of the Osan in the Pyrenees, and at other places in this region.		Another shock.			<i>Palasson, loc. cit.</i> p. 267.
— July 3. Smyrna.		A very violent earthquake. Two shocks of great violence were followed by twenty-four feebler, and slight motion until midnight of the following day.		Most of the city was either ruined by the shocks or destroyed by fires which broke out during the time. Each concussion was preceded by a subterranean noise like the firing of cannon.	<i>Annual Register</i> , &c. <i>loc. cit.</i>
From 1½ to 8 A.M., and even up to	5. Ditto.	Five or six slight shocks having been felt on the 4th, nine very violent ones			<i>Ditto</i> .

midnight.	and thirteen alighter occurred on this day.	More shocks	Ditto	Ditto	Ditto	These shocks were followed by the plague	Ditto	Ditto	Ditto	Gazette de France, <i>loc. cit.</i> ; Cotte.
1778, July 19, Ditto 6 P.M.	More shocks	Ditto	Ditto	Ditto	Ditto	These shocks were followed by the plague	Ditto	Ditto	Ditto	Gazette de France, <i>loc. cit.</i> ; Cotte.
— 21, Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	These shocks were followed by the plague	Ditto	Ditto	Ditto	Ditto.
10 A.M.	Ditto	Ditto	Ditto	Ditto	Ditto	These shocks were followed by the plague	Ditto	Ditto	Ditto	Ditto.
8 A.M.	Ditto	Ditto	Ditto	Ditto	Ditto	These shocks were followed by the plague	Ditto	Ditto	Ditto	Ditto.
Between 11 P.M. and mid- night.	Ditto	Ditto	Ditto	Ditto	Ditto	These shocks were followed by the plague	Ditto	Ditto	Ditto	Ditto.
— 31. S. Sepolcro in Italy	An earthquake	Very severe shocks, especially two du- ring the night.	— Aug. 1 Ditto	— 4.	— 15. Constantinople	On the 22nd lava flowed again from Vesuvius.	Palassou, <i>loc. cit.</i>	— Sept. 21. Peyrenère, in the valley of Aspe, in the Pyre- neæ.	— 1 A.M.	More. de France, Déc. 1778, p. 194; 25 Janv. 1779, p. 242; 25 Mars, p. 313; Cotte.
— 15. Constantinople	An earthquake	A very violent shock, preceded by two se- vere ones at 9 P.M. the evening before, and by a slighter on the 18th.	— Oct. 1. Smyrna	1 P.M.	— 3. Ditto	More ruins were produced.	— 24 and 30.	— Nov. 1, Ditto	— 3, 4, 5, 7 and 16.	More. de France, Déc. 1778, p. 194; 25 Janv. 1779, p. 242; 25 Mars, p. 313; Cotte.
— Oct. 1. Smyrna	Two violent shocks, followed by eight others, not so severe, up to 9 P.M.	More shocks	— 3. Ditto	— 24 and 30.	— Nov. 1, Ditto	Produced fresh disasters.	— 3, 4, 5, 7 and 16.	— 7. Cadiz	— 7 P.M. (8½ ac- cording to the Gaz. de Fr.)	Ditto.
— 3. Ditto	More shocks	Ditto	— 24 and 30.	— Nov. 1, Ditto	— 3, 4, 5, 7 and 16.	The winter was excessively cold, with ice and snow, which is rarely the case in this place.	— 7 P.M. (8½ ac- cording to the Gaz. de Fr.)	— 12. Grenada in Spain	— 13 and 14.	Ditto.
— 24 and 30.	Ditto	Those of the 5th and 16th were particularly violent.	— 3. Ditto	— 24 and 30.	— Nov. 1, Ditto	The winter was excessively cold, with ice and snow, which is rarely the case in this place.	— 7 P.M. (8½ ac- cording to the Gaz. de Fr.)	— 12. Grenada in Spain	— 13 and 14.	Gazette de France, 15 Déc.; Cotte.
— 3. Ditto	More shocks	A rather smart shock	— 24 and 30.	— Nov. 1, Ditto	— 3, 4, 5, 7 and 16.	Several houses were slightly shaken	— 7 P.M. (8½ ac- cording to the Gaz. de Fr.)	— 12. Grenada in Spain	— 13 and 14.	Gazette de France, 22 Déc.; Cotte.

1.	2.	3.	4.	5.	6.
1778. Nov. 18. Trieste. 11 A.M.		A slight (or according to the Merc. de Fr. a very severe) shock.		Accompanied by a violent storm with thunder. v. Hoff gives the date 1779.	Gazette de France, <i>loc. cit.</i> ; Merc. de Fr. 15 Janv. 1779, p. 209.
18th hour (Italian time). — Dec. 19. In Hungary, at Hamouna, Wranow, Taverna, &c. to 26.	Padua	A shock			Toaldo, <i>loc. cit.</i>
— 31. La Concepcion, near Jomfront (department Orne) in Normandy.		Twelve shocks during this period.		Bertholon places this event in 1779	Cotte, <i>loc. cit.</i> ; Bertholon, Elec. des Mët.
— At the abbey of San Salvatore (in Italy, but in what state?).		An earthquake.			Ditto; Mém. de l'Institut, t. iv. p. 533; v. Buch, Canar. Ins. s. 375.
1779. Jan. 25. 5 <sup>h</sup> 40 <sup>m</sup> P.M.	Caracacas in the province of Cumana, S. America.	Some absolutely local shocks, not felt below the mountain. A violent earthquake, recurring as severely in three hours afterwards.		Houses thrown out of the perpendicular	Sarti, Saggio di Congettura sui Terremoti, cap. 2. Gazette de France, 8 Juin; Cotte.
— Feb. 5. Orizaba in Mexico		An earthquake.			Cotte, <i>loc. cit.</i>
— Night between 9 and 10.	Cauca, in the island of Candia.	Three shocks from E. to W., lasting 11 seconds. Felt also "en rade."	On the 4th March an extraordinary rise of the waters of the Baltic was observed. No shock mentioned		Gazette de France, 15 Oct.; Cotte.
— April 6. Hamouna in Hungary		An earthquake			Cotte, <i>loc. cit.</i>
4 <sup>h</sup> A.M. — 16. Constantinople		Ditto, consisting of two shocks.		The second shock awoke every one in Constantinople.	Mercure de France, 15 Juin, p. 195; v. Hoff.
— June 1. Bologna		A violent shock, lasting 3 seconds. Two others were felt during the next two hours, and the earth trembled slightly all the night.			Gazette de France, 9 Juillet et 10 Sept.; Le Comte de Chabot in the Journ. de Phys. t. xiv. p. 198.
— About mid-night.		Another shock.			Toaldo, <i>loc. cit.</i>
5th hour (Italian time). — 2. Bologna		A shock of equal in-			Gazette de France, &c. <i>loc. cit.</i>

6 A.M.		tensity and duration to that of the day before.		
1779. June 4. 7½ A.M.	Ditto	Another, longer and more intense, followed until the 10th by others, slighter in the city, but stronger in the country round.	Walls were cracked. On the 7th meteors were observed like a rain of fire at the mountain St. Michael in Bosco.	Ditto.
11th hour (Italian time).	Padua	Another shock.		Toaldo, <i>loc. cit.</i>
8. Ditto	Ditto	Ditto		Ditto.
12h 55m (Italian time).	Bologna	A violent shock, from E. to W., followed by a second.	The weather was calm, but cloudy. During the second shock a loud noise was heard in the air. The water in wells became warmer, and the magnetic needle deviated 3°. A letter from Rome, dated 18th August, says that the shocks still continued at Bologna.	Gazette de France, &c. <i>loc. cit.</i>
9h 5m A.M.	Padua	Another shock.		Toaldo, <i>loc. cit.</i>
14th hour (Italian time).	Padua	Another shock.		Toaldo, <i>loc. cit.</i>
26. Sienna		A violent shock		Soldani, quoted by Filla.
1h 30m P.M.		Another shock.		Gazette de France, 24 Septembre; Cotte.
July 1. Smyrna				Gazette de France, 14 Sept.; v. Hoff.
14. Rouen in France, and on the same day at Larabœ-Sagewerck in Hel-land, Sweden.		Shocks felt at each of these places.		
22. In Sweden; probably at the same place.		Another earthquake.		Ditto.
Aug. 8. Around Vesuvius, especially at Portici.		A violent commotion	Windows were broken and walls cracked at Portici. Accompanied by a rolling noise in the interior of the volcano, which had been in violent eruption since the 29th July, and continued so until the 26th August.	Hamilton in Phil. Trans. vol. lxx. pp. 42-84; Ditto in Suppl. to Campi Flegrei, p. 292; Vivenzio, &c.

1.	2.	3.	4.	5.	6.
1779. Sept. 21. Bergen in Norway Between 4 and 5 A.M.		A trembling shock			Gazette de France, 19 Nov.; Cotte.
Oct. 1. Naples 1 A.M.		Violent horizontal shocks from E. to W.			Gazette de France, 5 Nov.
— 20. Saint Giron in the Py- renees. 9 A.M.		A slight shock, follow- ed in three-quarters of an hour by a stronger vibration from N.W. to S.E., lasting 1 second.		Accompanied by a dull subterranean noise, that with the second shock being the louder. Some stones were thrown from the town walls.	Palassou, <i>loc. cit.</i>
— Nov. 2. Vivonne in Poitou		One shock			Cotte, <i>loc. cit.</i>
— 9. Bologna		Two more shocks, one of them rather severe.			Ditto; Gazette de France, 21 Déc.
— 23. Padua		More shocks		During an eclipse	Toaldo, <i>loc. cit.</i>
2nd hour (Ita- lian time). — Dec. 1. Vienna		An earthquake shock			Cotte, <i>loc. cit.</i>
— 5. Bergen, between Hanau and Frankfurt.		Ditto			Ditto.
— 12. Portici and Resina, near Naples. At night.		Rather a violent hori- zontal shock.			Ditto; Gaz. de Fr. 21 Janv. 1780.
— 22. Valley of Ossau in the Pyrenees. About 6 P.M.		One shock			Palassou, <i>loc. cit.</i>
— 24. Pistoia in Tuscany		A violent shock		Commotions of this kind were frequent here, especially in the mountain country at San- Marcello and Casteglano.	Gazette de France, 22 Fév. 1780; Cotte.
— 28. Valley of Ossau in the Pyrenees, and particu- larly at Nay.		A vibratory shock from S.W. to N.E., more violent than that of the 22nd.			Palassou, <i>loc. cit.</i>
— 31. Pistoia again		Another shock			Gazette de France, &c. <i>loc. cit.</i>
About 6 P.M. 1780. Jan. 15. 6th hour (Ita- lian time).		Another shock			Toaldo, <i>loc. cit.</i>
— 20. Mont Dauphin and Em- brun in Dauphiny. Half an hour after midnight		A shock from S. to N., lasting 2 seconds.		Accompanied by subterranean noise at Mont Dauphin.	Gazette de France, 18 Fév.; Cotte.

or 21st?) 1780. Jan. 27. 6 P.M.	Malta	Three violent shocks.		The fortifications were injured	Gazette de France, 4 Avril; Cotte.
(according to others, on the 22nd.)	Java	An earthquake			Hist. Gén. des Voyages, t. ii. p. 401; Raffles' History of Java, vol. ii. p. 234, and Append. p. 7; Verhan- del. van het Batavian Genootsch. D. 2. BL 51.
— 28.	Mount Etna	A trembling		The volcano had remained at rest for 14 years.	Ferrara, Descrizione del Etna, p. 125.
Towards the end of the month.	Various places in Sicily	Severe shocks		This fact is obviously connected with, if not merely the same as the preceding.	Gazette de France, 6 Juin et 4 Août.
— Feb. 2.	Auvergne in Nibousan, France (?).	An earthquake	<i>Alteburg</i>		Cotte, <i>loc. cit.</i>
— 5.	Padua	Another shock			Toaldo, <i>loc. cit.</i>
11th hour (Ita- lian time).	9. Ditto	Ditto			Ditto.
9th hour (Ita- lian time).	18. Selb in the Voigtland of Baireuth.	Continuous shocks			Ziehen, Nachricht von einer bevor- stehenden grossen Revolution der Erde, 1783, 11-23 and following pages. Ditto.
About same hour.	23. Ditto	Ditto, more violent, followed by others at 3 (A.M. or P.M.?) the same day.			
— 24.	Ditto	Ditto, very sensible.			
2 <sup>h</sup> 45 <sup>m</sup> P.M.	Throughout the whole of the country round Wetzlar and Königs- berg. Also, though feeble, at Breitenbach.	A severe shock of 2 seconds' duration.		The glasses on the tables were made to ring	Ditto.
Between 6 and 7 P.M.	6. Selb again			Heavy snow and wind the day before	Ditto.
9 <sup>h</sup> 15 <sup>m</sup> P.M.		A final shock. All those felt at this place appeared to come from the S.W.			Ditto.



1.	2.	3.	4.	5.	6.
1780. Feb. 26. Between mid- night (of the 23th) and 1 A.M. In the morn- ing.	Coblentz	A severe shock			Zichen, Nachricht von einer bevor- stehenden grossen Revolution der Erde, 1783, 11-23 and following pages.
A little before 5 <sup>h</sup> 30 <sup>m</sup> P.M.	Wetzlar	Two shocks felt this morning, and one on the following day. A much heavier shock than that at mid- night.			Ditto.
6 P.M.	Dachsenhausen (Hesse- Darmstadt).	A shock lasting not less than a minute. S. to N., followed by another (feebler) the following morn- ing between 4 and 5 A.M.		Accompanied by loud noise, both under ground and in the air.	Ditto.
6 <sup>h</sup> 35 <sup>m</sup> P.M.	Boppard on the Rhine...	A severe shock from S. to N., followed by another (feebler) the following morn- ing between 4 and 5 A.M.		It was remarked that several clocks had stopped on the evening of the 23th. At 7 <sup>h</sup> 45 <sup>m</sup> P.M. a violent gust of wind from the west was per- ceived at Wiesbaden, Frankfurt on the Maine, &c., but decreasing in violence the further it extended from the Rhine.	Ditto.
— 27. 4 <sup>h</sup> 45 <sup>m</sup> A.M. 10 <sup>h</sup> 30 <sup>m</sup> A.M.	Coblentz Ditto	A feeble shock, but lasting a long time. Another, still slighter.		The heavens looked unusually stormy. At St. Gothard slight motion had been observed, par- ticularly on the 22nd at 7 P.M. And in the course of the month the lake of Wallenstadt and the river Reuss exhibited agitation, du- ring which the earth shook, particularly at Lucerne. Many of these shocks on the Rhine probably occurred in reality at the same hour.	Ditto.
—	Tabriz in Persia	A violent earthquake.		Did great damage	Cotte, loc. cit.
End of the month, and on March 3.					
— Mar. 13.	Ena and throughout almost the whole of Sicily.	Trembling shocks			Ferrara, Descrizione, &c. loc. cit.; Gazette de France, 6 Juin.
— 28.	Sicily and Calabria	Ditto			Catta. loc. cit.: Gazette de France.

— 29. —	lages. La Rochelle and Roche- fort in France.	A trembling.....	.....	.....	Cotte, <i>loc. cit.</i>
— May 2. —	The Limousin, Poitou, St. Aunis, and in Brit- tany.	Several shocks .....	.....	.....	Ditto.
— — —	9. Bologna .....	Aratherviolent shock, accompanied by a very distinct oscil- lation. Two days after, a slighter shock.	.....	Accompanied by noise. An extraordinary mass of vapour was observed in Sicily. v. Hoff, quoting Cotte, gives the date 8th May.	Gazette de France, 20 Juin.
— — —	18. Etna, and many other places in Sicily, ex- tending into Calabria. Also in the Lipari Isles.	Many shocks every day up to the 25th. Others had been felt repeatedly since the end of April, and Messina was shaken almost the whole summer. At Ali and Fiume di Niso the shocks were sometimes so sudden and violent that every one be- lieved that a new volcano was about to burst forth there.	.....	Etna was in violent eruption until the 16th June. Vulcano also was in continual agitation, ac- compnied, as at Etna, by frightful noise.	Gazette de France, <i>loc. cit.</i> et 27 Juin; Ferrara, Descrizione, &c. p. 126; Dolomieu, Voy. aux îles Lipari, pp. 28 et 29; Mém. sur les trembl. de terre de la Calabre en 1783, p. 69.
— — —	25. Rimini, Ravenna, and Caserta (Casero?).	Tremblings .....	.....	.....	Cotte, <i>loc. cit.</i>
21 <sup>st</sup> 45 <sup>m</sup> (Ital. time).	Padua .....	Another shock .....	.....	.....	Toaldo, <i>loc. cit.</i>
— July 30. — 10 p.m.	Genoa .....	A very slight shock, lasting some se- conds.	.....	.....	Gazette de France, 8 Sept.; Cotte.
— Aug. 1 to 4. —	Tortona in Italy .....	Several rather smart shocks.	.....	.....	Gazette de France, 19 Sept.; Cotte.

1.	2.	3.	4.	5.	6.
1780, Aug. 29. Hafodunos, 8 <sup>h</sup> A.M.	Dawning. At Hafodunos (at 8 <sup>h</sup> 37 <sup>m</sup> 30 <sup>s</sup> ) two shocks from S.E. to N.W. At Downington, two severe shocks from N.W. to S.E.	At Hafodunos (at 8 <sup>h</sup> 37 <sup>m</sup> 30 <sup>s</sup> ) two shocks from S.E. to N.W. At Downington, two severe shocks from N.W. to S.E.		The barometer was not affected at Hafodunos. Phil. Trans. vol. lxxi. pp. 193 and 331.	
— Night between 29 and 30.	At Downington, two severe shocks from N.W. to S.E.	A slight shock			Gazette de France, 3 Oct.; Cotte.
— Sept. 14. Port in Sicily.	An earthquake	Three violent shocks.		Perrey says, "Ne faut-il pas lire Patti?"	Cotte, <i>loc. cit.</i>
— 21. Regusa.	Three violent shocks.	The first two succeeded each other almost without any interval, and lasted sixty seconds. Direction = E. to W.		Houses were injured	Gazette de France, 1 Déc.; Cotte.
— 2 <sup>h</sup> 15 <sup>m</sup> P.M.					
— Oct. 27. Christianity in Norway.	An earthquake				Cotte, <i>loc. cit.</i>
— Probably about the beginning of this month.	A very violent earthquake, preceded by others for some time.			The castle of Eropeter with its garrison of 300 Turks was swallowed up. Thirteen small villages and their inhabitants disappeared in like manner.	Merc. de France of 11 Nov. p. 56, quoting "la rubrique" of <i>Leqhorn</i> of the 15th Oct., which quotes letters from Trieste.
— 5th hour (Ital. time).	Padua	Another shock			Toaldo, <i>loc. cit.</i>
— 13. Tornea in Lapland.	One shock			Keilhan reports this event on the 15th	Cotte, <i>loc. cit.</i> ; Keilhan, <i>loc. cit.</i>
— 31. Dijon.	Bourbonne-les-Bains	At Dijon several rather violent shocks. At Bourbonne-les-Bains they were violent and in the direction S. to N. At Vaivre and Vesoul one oscillatory shock from W. to E., of four seconds' duration; followed in half an hour by a		At Dijon accompanied by a noise like that of a carriage rolling rapidly over pavement. At Vaivre and Vesoul an undulating sound was heard, and in the middle of it a sudden low explosion. The second shock threw down furniture.	Gazette de France, 10 et 14 Nov., 1 Déc.; Cotte.
— 3 <sup>h</sup> A.M.	Bains Haute-Marne.				

and 5 P.M.	N.E. to S.W.			
11. Hagenau in Alsace .....	One shock .....	Attended with an extraordinary noise. The windows were shaken, and the furniture, &c. thrown about.	Cotte, <i>loc. cit.</i>	
18. Newcastle, York, Leeds, Whitehaven, &c. ....	Lasted about 2 seconds .....			
Island of Amboyna .....	An earthquake .....	Houses were injured .....	Annalen der Physik. 30. S. 192.	
1781. Jan. 2. In the most elevated portion of the province of Sienna. ....	Various shocks during the month, especially on this night. ....		Gazette de France, 15 Fév.; Cotte.	
27. Erzeroum in Armenia. ....	A violent earthquake. ....	Ditto .....	Cotte, <i>loc. cit.</i> ; Huot, <i>loc. cit.</i>	
Feb. 13. Messina in Sicily .....	Several shocks .....	During a furious storm .....	Gazette de France, 13 Avril; Cotte.	
25. Aricia in Italy (La Riccia?) .....	An earthquake .....		Cotte, <i>loc. cit.</i>	
April 4. Padua .....	One shock .....		Toaldo, <i>loc. cit.</i>	
10 P.M. ....	Severe shocks .....	The houses in the Romagna were cracked, and the pavement of the streets broken up. At Castrocaro a mountain separated into two parts. At Forlì chimneys were thrown down.	Gazette de France, 15 et 18 Mai; Ephémérides de Mannheim (Société Palatine), 1781, p. 276; Cotte; v. Hoff.	
3 P.M. ....	Ditto. ....		Ditto.	
16. St. Maurice le Girard in Poitou. ....	One shock .....		Cotte, <i>loc. cit.</i>	
24. Padua .....	Another shock .....	On the same day an eruption of Etna began, and lasted the whole of May.	Toaldo, <i>loc. cit.</i> ; Ferrara, Descrizione, &c. <i>loc. cit.</i>	
3rd hour (Italian time). ....	Several shocks .....		Cotte, <i>loc. cit.</i>	
26. Arles in Provence .....	A slight shock from N. to S., felt more strongly further away. ....	The volcano continued in a state of eruption .....	Phil. Trans. vol. lxxii. p. 6; Ferrara, <i>loc. cit.</i>	
May 4. ....	Many other violent shocks were felt during the month.			
21 <sup>st</sup> 15 <sup>th</sup> (Italian time). ....				

1.	2.	3.	4.	5.	6.
June 3. Padua ..... 4 <sup>5</sup> <sup>m</sup> (Ita- time). not given	Another shock				Toaldo, <i>loc. cit.</i>
Cagli in the duchy of Urbino, and in the Romagna. Also at Borgo-San-Sepolcro, apparently coming from Mounts Nero and Jago, and extending to Anghiari, Arezzo, and other places in Tuscany and the Romagna.	At Borgo-San-Sepolcro a severe shock from S.E. to N.W. The earth continued to tremble almost the whole day.			At Borgo-San-Sepolcro walls were cracked. The spring had been dry, but the summer was stormy.	The Cotte, <i>loc. cit.</i> ; Pilla quotes Sarti, <i>loc. cit.</i>
20. "Baillage" of Orgueil in Franche Comté.	An earthquake	Accompanied by an inundation.			Cotte, <i>loc. cit.</i>
July 1. The duchy of Urbino. The shocks extended all along the Adriatic, and were felt at Ancona, Sinigaglia, Rimini, and other places in the States of the Church.	Severe shocks continued to be felt.			The town of Cagli was abandoned. Monte Nero opened.	Gazette de France, 7 Août; Hamilton.
Florence and Faenza ...	Some shocks were felt				Gazette de France, 17 Août et 4 Sept.
15. Lisbon ...	A rather severe earthquake, lasting some seconds.				Ditto, 24 Août; Cotte.
Padua ...	Another shock				Toaldo, <i>loc. cit.</i> ; Ephém. de Mannheim, 1781, pp. 281, 282.
17. Florence, Faenza, and Marseilles.	A very violent and sudden shock, followed by a rapid oscillation from E.			The earth rose circularly from S. to N. more than once.	Gazette de France, 17 Août et 4 Sept.; Cotte.

13 <sup>h</sup> 55 <sup>m</sup> (Italian time). 1781. Aug. 14. Foligno in the duchy of Spoleto.	Padua .....	The motion was almost continual up to the 22nd. Another shock .....	.....	.....	Toaldo and Ephém. de Mannheim, <i>loc. cit.</i> Gazette de France, 5 Oct.; Cotte.
— Sept. 10. Padua .....	.....	One shock on this day, five others were felt during the month. Another shock .....	.....	.....	Ephém. de Mannheim, 1781, p. 285.
17 <sup>h</sup> hour (Italian time). 1781. Aug. 14. Foligno in the duchy of Spoleto.	Padua .....	At Milan a rather severe shock. At Mantua an undulatory motion, lasting five seconds, and felt more strongly at Lodi. At Crema, the motion (undulatory) was from E. to W., and lasted 1 minute.	.....	.....	Gazette de France, 12, 19 et 30 Oct.; Cotte.
— 22. At the lake of Bracciano, between Rome and Viterbo.	.....	An earthquake .....	.....	.....	Cotte, <i>loc. cit.</i>
— 23. Harderwyck on the Zuydersee.	.....	A trembling shock .....	.....	.....	Ditto.
— Oct. 2. Jamaica .....	.....	Several severe shocks .....	.....	.....	Accompanied by a tremendous hurricane. v. Hoff, Annual Register, vol. xxiv. p. 3; on the authority of Cotte, gives the date 2nd October, 1780.
— 6. Presburg in Hungary .....	.....	Vibratory shocks .....	.....	.....	Cotte, <i>loc. cit.</i>
— 10. Faenza and Berzighella.	.....	At Faenza 3 shocks, and at Berzighella eleven were counted.	.....	.....	Gazette de France, 16 Nov.; Cotte.
— 3rd to 5th hour (Italian time). Nov. 17. Padua .....	.....	A slight shock .....	.....	.....	Ephém. de Mannheim, 1781, p. 288.
10 A.M.	.....	.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
1. Nov. 22. P.M.	Padua	A slight shock.		The magnetic needle was agitated	Ephém. de Mannheim, pp. 289 et 292.
2. Jan.	Beneventum, Naples, &c.	More shocks		Such numerous earthquakes had occurred in Italy the year before that the pope ordered public prayers to be offered up for their cessation. The walls were shaken to their foundations, and the next morning, at 3 A.M., a neighbouring hill covered with trees left no trace but a frightful chasm. The whole of its summit had fallen into the sea, and there formed a peninsula of 300 feet long by 1200 wide.	Bertholon, Électricité des Météores, t. i. p. 292.  Gazette de France, 17 Mai.
- Feb. 25. 1 hour before the event- Angelus.	Ortona (in the Abruzzo Citerior).	Very violent			
- March 3.	Beneventum in the king- dom of Naples.	An earthquake			Cotte, <i>loc. cit.</i>
- April 5.	La Rochelle in France.	Ditto			Ditto.
- May 15.	In the county of Trent- schin in Hungary.	No shock is mention- ed. Possibly only a landslip.		A chasm opened during a storm, and fifty-three houses were swallowed up.	Perrey, Suppl. to memoir on Earth- quakes in the basin of the Danube, p. 76.
- 23.	Near the lake of Brusja in Westnorrlund, Swe- den.	<i>Probably</i> an earth- quake, though the event does not seem well authenticated.	A loud noise was heard, like thunder, and the waters of the lake rose in an ex- traordinary manner, producing a terrible inundation. On the 22nd the sea rose with great vio- lence on the coast of Formosa and the adjacent part of China, and remained eight hours above its ordinary level; having swept away all the villages along the coast, and drowned immense numbers of people.		Neue Abh. der Akad. zu Stockholm (German translation), B. 3. S. 312; Annual Register, vol. xxvi. p. 35.

1782. July 17 / Guadalupe .....	A vibratory shock ...			Lustrous and bells were set in motion in the upper stories of the houses. Walls were cracked. The barometer was agitated. v. Hoff gives the date 25th August.	Cotte, loc. cit. Gazette de France, 30 Août; Cotte.
— Aug. 15. / Grenoble in France..... 4½ P.M.	Violent oscillations from E. to W.				
Sept. 15. / Oléron on the southern slope of the Pyrenees.	A violent oscillation, following the direction of the chain of the Pyrenees from the Atlantic Ocean to the Mediterranean.				Palassou, loc. cit. p. 268.
Oct. Some days before the 7th.	Rome .....				Gazette de France, 12 Nov.
5. — 8 <sup>h</sup> 39 <sup>m</sup> P.M.	Mold in Flintshire, Almonk in Denbighshire, Bangor in Caernarvon, at St. Asaph, and in the Isle of Anglesea.			Accompanied by a noise like carriages rolling over pavement.	Phil. Trans. vol. lxxiii. p. 104.
— Night between 13 and 14.	Guadalupe .....				Cotte, loc. cit.
Dec. 9.	Bergen in Norway .....			v. Hoff, quoting Cotte, gives the date 15th October.	Gazette de France, 26 Nov.; Cotte.
— Dec. 9.	Vienne in Dauphiny. Ditto				Cotte, loc. cit.; v. Hoff.
— 26 and 27.	Oléron on the southern slope of the Pyrenees.				Cotte, loc. cit.; Palassou, loc. cit.
— End of the year.	Comorn in Hungary .....			The town had been almost entirely destroyed by an earthquake, according to a letter from Vienna of the 4th January 1783.	Gazette de France, 28 Janv. 1783.
1783. Jan. 6.	In the Altai mountains in Siberia, especially on the Irtsch.				Kefenstein.
— 10. — 1 <sup>st</sup> 30 <sup>th</sup> A.M.	Marseilles .....				Cotte, loc. cit.



1.	2.	3.	4.	5.	6.
3. Jan. 27. Siena and on the coast of Tuscany.		An earthquake which does not seem to have recurred during the disturbances in Calabria.			Pilla quotes Soldani.
- Feb. 5. Througout Calabria and Sicily. The centre of disturbance was, according to Hamilton, under the town of Oppido; others place it beneath Monte Aspromonte or Aspromonte in the Apennines; while Dolomieu considers that there were three distinct centres, Oppido being the principal one. Hamilton says, that if two circles be drawn with the latter as centre, and with radii of twenty-two and seventy-two Italian miles in length, the smaller one will include all the places where the earthquake was felt with destructive violence, while the larger will circumscribe the whole district shaken. Some of the shocks extended to the Romagna, and even Rome itself, and to the Lipari Isles.		One of the most disastrous earthquakes ever felt in Europe. After some slight oscillations the tremendous shock which did so much mischief took place, lasting about two minutes. The motion seems to have been very complex, and was divided by the Italians into three kinds, "originale, oscillatorio, e vorticoso." At Oppido the shocks seemed to come up vertically from beneath. Many other violent shocks were felt, especially during the night of the 6th, on the 7th at 1½ p.m., and almost continuously with more or less violence up to the 28th March. Those of the 23rd, 27th, and 28th of February, and the 1st and 28th of	The sea in the straits of Messina was violently agitated, retreating suddenly, leaving the shore dry to a great distance, and then as suddenly coming back with such rapidity and violence as to carry off numbers of people who had fled from their houses to the shore on account of the earthquake.	All the towns and villages of Calabria were shaken with tremendous violence. Those built on loose detrital foundations were levelled with the ground, while those situated on solid rock, though greatly shaken, for the most part remained standing. On the 28th of March, however, the contrary seemed to be the case. Those on the east of the Apennines suffered less than those on the west. The devastation throughout the "Plain" of Calabria and Sicily was awful. In both regions a subterranean murmuring noise was heard before the shock; in Calabria it seemed to come from the S.W. At Scylla (Straits of Messina) a portion of a mountain fell into the sea (on the night of the 5th), when great damage was done in Sicily by the great sea wave resulting from its fall. Tremendous effects were produced over the surface of Calabria, hills were overthrown and levelled with the plain, chasms opened in the ground and swallowed up people in the moment of their flight, springs dried up, the course of rivers was stopped for a moment, to be renewed immediately after with such violence as to tear away every obstruction. Stromboli, which under ordinary circumstances constantly emits smoke, ceased almost, if not altogether, to do so on this day. Etna and Vesuvius were also perfectly still. The weather was unnaturally still and gloomy, like that which often precedes great thunderstorms, and immediately before the shock a heavy, whistling blast of wind was observed.	Hamilton in Phil. Trans. vol. lxxiii. p. 169; Vivenzio, Istoria e Teoria de' tremuoti, &c. Napoli, 1783; Vivenzio, Istoria de' tremuoti avvenuti nella provincia della Calabria, &c., Napoli, 1788; Grimaldi, Descrizione de' tremuoti accaduti nell Calabria nel 1783, Napoli, 1784; Istoria de' Fenomeni del terremoto avvenuto nelle Calabrie, &c. Napoli, 1784; Lyell's Principles of Geology; v. IIoff; Dolomieu, Mémoire sur les tremblemens de terre ressentis en Calabre en 1783.

<p>in the region mentioned above.</p>	<p>(under the so-called vortices), lasting two minutes, com- pleted the destruc- tion of the 5th Fe- bruary. On the 25th and 26th April, the 5th May, the 8th, 11th and 12th June, the 29th July (at 1 and 6 a.m.), and the 30th August, severe shocks were felt, and in Calabria the motion had not ceased on the 20th September.</p>	<p>the sea bottom itself sank considerably at the same place. At Terranova a church tower was split in two by a cleft running from top to bottom, and the one-half with the foundation raised considerably (producing what in rocks would be called a "fault"). At the monastery of S. Bruno some stones lying upon others were moved horizontally upon the lower ones, without the place of the latter being altered. In some places the earth appeared cleft by star-shaped fissures, like a cracked pane of glass. This year was remarkable for the extraordinary dry fog, which beginning in Calabria in February, overspread until au- tumn the greater part of Europe, and ex- tended even to the Azores. This fog, though not consisting apparently of moisture, was so dense that the sky was quite obscured, appearing a light grey colour instead of blue, and the sun presented a blood-red disc. In Calabria the darkness was so great that lights were obliged to be used in the houses, and vessels at sea repeatedly came in collision. The odour was most disagreeable. For further details of this most remarkable earthquake see the various memoirs referred to.</p>	<p>Gazette de France, 14 Mars; Cotte; v. Hoff. v. Hoff quotes Labillardière. Gazette de France, 8 Avril; Ziehen, loc. cit. p. 46; Cotte; v. Hoff.</p>
<p>1793. Feb. 13. Neustadt in Hungary ... — In middle the month. of the month. — 18. Between mid- night (of the 17th?) and 1</p>	<p>Some slight vibratory shocks. An earthquake felt throughout the whole island. Several shocks from the S.W.</p>	<p>Island of Amboyna..... Selb in Upper Saxony....</p>	<p></p>

1.	2.	3.	4.	5.	6.
Feb. 25, 7 18 p.m.	Solt in Upper Saxony...	Several shocks from the S.W.			Gazette de France, 8 Avril; Ziehen, <i>loc. cit.</i> p. 46; Cotte; v. Hoff.
— 28	Palermo in Sicily	Several slight shocks felt during the month, that on this day being rather more severe.		Perry considers this and the other Italian earthquakes given by him further on as distinct from those of Calabria. It is difficult to believe however that they were not at least closely connected therewith.	Gazette de France, 2 Mai.
March 3.	Paris	Several shocks		The Gentleman's Magazine is the only authority I have been able to find for this event, which is not mentioned by either Perry or v. Hoff. It appears therefore somewhat doubtful.	Gentleman's Magazine, vol. liii. p. 268.
— 6.	In the Angoumois (now a department of France).	A shock lasting two seconds.		On the 9th a mountain fell at Arles in Auvergne. No mention made of any shock.	Gazette de France, 1 Avril; Cotte.
— 18.	At Irkutsk, and along the Altai chain, from Lake Baikal to the Altai kolywan.	Several shocks			Gazette de France, 25 Juillet; Cotte; v. Hoff; Humboldt, <i>Asie Centrale</i> , t. ii. p. 112.
— 18.	Padua	An earthquake from S. to N.			Éphém. de Mannheim, 1783, p. 567.
— 25.	Malenmort in Provence	Two shocks. According to v. Hoff shocks were felt here also on the 26th.		Preceded by a loud noise. At Salomon-de-Crau, three leagues from Malenmort, the weather was clear and fine, yet the electrical machine gave but very feeble sparks (a very uncertain subject of observation). A strong wind, without a fixed direction, succeeded the shocks, and lasted for an hour.	Gazette de France, 18 Avril; v. Hoff.
— 25-26.	Solt in Upper Saxony	More shocks			Ziehen, <i>loc. cit.</i>
— 26.	Venice, Padua, S <sup>ra</sup> Maria, Zante, and Cephalonia.	Shocks felt at all these places, according to v. Hoff.			v. Hoff.
— 28.	In Calabria	A very violent shock. (See 5th Feb.)			Ditto.
April 5.	Mannheim	Several shocks			Ditto.
— 8.	Vienna; Comorn, and	An earthquake		It is hardly likely that this is a distinct event.	Gentleman's Magazine, vol. liii. p. 300.

1783. Apr. 11.	Comorn in Hungary	.....	.....	The fortress was destroyed	Férussac, Bull. des Sc. Nat. t. xviii. p. 195. Ziehen, <i>loc. cit.</i>
— 12.	Selb in Upper Saxony	Another shock, so violent that the inhabitants believed their houses about to fall.	.....	.....	.....
— 13.	Lisbon. Also at St. Jago in Galicia.	Three severe shocks at Lisbon. One only, but that a violent one, at St. Jago.	.....	.....	Gazette de France, 12 Juin; Cotte.
— 4 A.M.	Comorn, along the Danube, at Raab, Presburg, Pesth, Buda, Odimburg, and Estherhaz in Hungary. Also at Vienna. The centre appeared to be at Comorn.	Very violent. At 10 A.M. twelve severe shocks had been reckoned at Comorn. The first at that place was from S. to N. At Offen-Pesth slight shocks had been felt from 2 A.M.	.....	At Presburg followed by a violent storm. The mineral waters of Buda became warmer than usual. Comorn was almost completely destroyed, and it was resolved to rebuild it further from the Danube.	Gazette de France, 20 et 27 Mai, 3 et 13 Juin; Ephém. de Mannheim, 1783, p. 141; Cotte; Ziehen, <i>loc. cit.</i>
— 1½ P.M.	Colebrook Dale in England.	An earthquake.	.....	.....	Gentleman's Magazine, vol. liii. p. 442.
May 5.	Grenoble in France	Ditto	.....	.....	Cotte, <i>loc. cit.</i>
— 12.	Comorn in Hungary	Nineteen shocks during this period.	.....	The last of these shocks, more violent than that of April 22, threw down the newly-built walls.	Gazette de France, 1 Juillet.
to 31.	Constantinople	A single shock.	.....	.....	Ditto, 15 Juillet; Cotte.
— 1.	In the province of Skaptarfjall, Iceland.	Numerous and violent shocks.	.....	Accompanying violent eruptions of Skaptarfjall and other volcanoes of Iceland, which began about the end of May, and continued until the following year. The river Skapta disappeared completely, and a new island rose from the sea near the coast. For details see v. Hoff.	Stephensen's account of this eruption, Altona, 1786; Henderson; Penant, Le Nord du Globe, t. i. p. 308; Eyriæ, Abrégé des Voy. Mod. t. vii. p. 186; Marmier, Hist. d'Islande, p. 355; Gaz. de Fr. 22, 25 Juillet, 8 Août, 2 Déc. &c. Cotte, <i>loc. cit.</i>
— 8.	Calabria	More severe shocks.	.....	.....	Cotte, <i>loc. cit.</i>
to 13.	Godgarl in Ost Gothland, Sweden.	Some shocks from E. to W.	.....	An hour before a noise like that of a carriage rolling over pavement was heard. v. Hoff (without quoting any authority) records another earthquake in Ost Gothland on the 15th July. It is very improbable that there were really two.	Gazette de France, 1 Août; Cotte.
Between 4 and 5 A.M.			.....		

1.	2.	3.	4.	5.	6.
3. June 20 d 22.	Florence .....	Vibratory shocks.....	Unusual motion of the sea was observed near Naples. From the way in which the date is given, it seems probable that the earthquake at Florence occurred on the 20th, and the agitation of the sea at Naples on the 22nd.	.....	Cotte, <i>loc. cit.</i>
- July 6, 57 m.	Dijon, Verdun, St. Jean-de-Leone, &c., over a space circumscribed by a line passing through Langres, Châtillon, Aignay-le-Duc & Montbard; extending to the Rhone and felt at Besançon.	At Dijon two perceptible oscillations followed by a slight trembling. Apparent direction = N.N.E to S.S.W. At the three places named next, the clock had struck at the time. Some people believed the motion to be vertical. At Besançon a slight oscillatory but vertical shock was felt at 10 <sup>h</sup> 3 or 4 <sup>m</sup> ; and at 10 <sup>h</sup> 15 <sup>m</sup> two shocks were observed at Lausanne, and three at Bourg and Salins.	.....	At Besançon it appeared as if the air were compressed against the doors and windows. The noise was not subterranean, nor aerial, but like that produced on throwing a handful of grain against a flat surface. The weather was hot and fine, and was not altered. The celebrated mist which obscured almost the whole of Europe and part of Asia this year, was observed here.	Mém. de l'Acad. de Dijon, 1783, p. 26; Mém. de la Soc. de Lausanne, 1783, p. 120; Gaz. de Fr. 22 Juillet; Journ. de Paris, 22 Oct. 1784.
18	Calabria .....	Severe shocks were still felt.	.....	.....	Vivianzo, 1786, p. 28.
19.	Tripolis in Syria, and a part of the mountains of Lebanon.	Two shocks, rapidly succeeding one another, and lasting altogether 8 or 10	.....	.....	.....
20.	.....	.....	.....	.....	.....

Preceded by a hollow noise like the roaring of distant waves. The weather before had been very tempestuous, with fogs and violent rain.

Masses of rock were shaken down from the

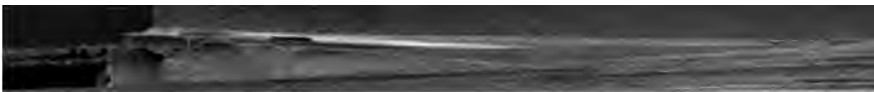
earthquake was felt over a space of twenty or thirty leagues.		details see v. Hoff.	
— 29. Calabria and Messina... 6 A.M.	A violent shock at each of these hours. (See 5th February.)	Four villages were completely ruined	Annual Register, vol. xxvi. p. 36.
Aug. 9. Launceston in Cornwall.	An earthquake		Gentleman's Magazine, vol. liii. p. 708.
— 30. Messina	Another shock. (See 5th February.)	A slight eruption of Vesuvius took place on the 18th.	Cotte; v. Hoff.
Sept. 7. La Rochelle and the en- virona, France.	A slight shock.	Accompanied by subterranean noise.	Gazette de France, 30 Sept.; Cotte.
Oct. 26. Kapnik in Transylva- nia.	Some shocks		Cotte.
Nov. 17. Bolsena in the States of the Church.	Ditto		Ditto.
— 29. New York, United States	A rather violent shock.		Gazette de Leyde, 1784, Janv. 23.
— 30. Ditto	Another of less vi- olence.		Annual Register, vol. xxvi. p. 60.
— of the Thessalonica	A violent earthquake.	The shocks here were considered to be more de- structive than those at Messina. On the 25th and 29th November falls of portions of moun- tains in Spain took place. (See Parrey's me- moir on Earthquakes in the Iberic peninsula, p. 22.) There is no proof of these events be- ing consequent on earthquake shocks.	
Dec. 8. Pistoia in Italy	An earthquake shock.	On the 9th a noise like thunder was heard at Cambrai (depart. Nord) in France. It was supposed to proceed from a slight earthquake, though no shock seems to have been felt. (Gazette de France, 19 Déc.)	Cotte, loc. cit.
— 14. Aleppo	A slight vibratory shock.		Volney, Voyages, &c. t. vi. p. 359.
— The Danish island of etween Christian near Born- holm.	Three shocks, of which the second was the most severe.		Merc. de France, 7 Fév. 1784; v. Hoff.

1.	2.	3.	4.	5.	6.
3. Dec. In course of the month.	Messina, and in Calabria.	Two or three more shocks.		Although no shocks are specified in October and November, it is probable that these regions were not during that time altogether still.	Merc. de France, 31 Janv. 1784.
— End of the year, and during of 34.	Guatemala	Terrible shocks		Houses were thrown down. Humboldt (in his Nouvelle Espagne, t. i. p. 304) mentions terrible subterranean noises, as heard here from the 9th of January to the 12th February, 1784, and which extended as far as Guanajuato; but he adds that <i>no other</i> phenomenon followed them. Perrey thinks however that this passage refers to phenomena connected with those here recorded.	Journ. Encycl. 1 Mai, 1784.
4. Jan. 17. and 9 P.M.	La Rochelle in France.	Two shocks at the hours mentioned (v. Hoff, quoting the Journal de Paris, gives but one, namely at 9 P.M.). A vibratory shock		Accompanied by a violent storm at 9 P.M., with thunder, lightning, and hail. Some persons denied the fact of there being an earthquake altogether.	Merc. de Fr. 14 Fév., 20 Mars; Journ. de Paris, 4 Fév.
— 20. In the afternoon.	Siebenlehn near Nossen in Saxony, on the northern slope of the Erzgebirge.				Hamburger Correspondent, 1784. Nr. 19.
— 23. In Hungary.		Several ditto			Cotte.
— Feb. between 10 and 11. March.	In the suburb Leopoldstadt at Vienna.	Some people <i>believed</i> they felt a trembling.			Hamburger Correspondent, Nr. 28.
— and March.	In Calabria	Pretty numerous shocks, of which one (at Terranova) was very severe.		The preceding winter had been unusually severe and long continued both in Europe and America. A thaw of alarming suddenness took place in the middle of March, but afterwards severe cold set in again.	Dolomieu, <i>loc. cit.</i> pp. 50 and 69; Hamburger Correspondent, Nr. 57.
— Mar. 6. P.M.	In some Danish islands.	Several shocks.			Cotte, <i>loc. cit.</i>
— 19. P.M.	Udina in Italy.	One shock			Taaldo, <i>loc. cit.</i>
— 20.	Prague, the circle of Leutmeritz, and the circle of Saaz as far as Eger.	A very violent shock.		Accompanied by a loud subterranean noise. At Osek a mountain opened, and a little stream came forth which ran for several hours. Several buildings, amongst others a belfry at Dux, were injured. On the 18th a mountain fell in	Schriften der Berlinischen Gesellschaft naturforschenden Freunde. B. 5. S. 490; Cotte.

in the evening.	the village and a circle of three leagues radius round it being shaken.	Another severe shock.	Preceded by a terrible storm, with lightning and hail.	
— April 1.	In Calabria. Both here and at Messina fresh shocks seem to have occurred during the month.	Seven violent shocks.		Ditto; Gentleman's Magazine, vol. liv. p. 376.
— Five minutes past midnight to 2½ A.M.	7. Albino, Frescati, and other places near Rome.			
— 20.	Briançon in France.	A vibratory shock.		v. Hoff.
— May 11.	Zailgroz in Hungary.	Several shocks.	A thick vapour arose from a spring at this place.	Cotte.
— 13.	Arequipa. Also the districts of Cumana and Maquiqua, South America.	A terrible shock at Arequipa.	The districts of Cumana and Maquiqua were devastated. Masses of soil were transported to great distances.	Merc. de Fr. 8 Janv. 1785; Journ. Encycl. 1 Fév. 1785.
— June 5.	Caub on the Rhine.	One shock, followed by another at 6 P.M.	A mist preceded the first shock, and a storm followed it on the Rhine.	Hamburger Corresp. Nr. 99.
Between 12 noon and 1 P.M.	Still more violent at the castle of Gutfenfels, and the Pfalz. Reggio in Calabria.	Repeated trembling motion during this period.		Cotte.
On to the end of the month.		A severe shock.		Hamburger Corresp. Nr. 103.
— 6.	Carrara.			
About 8 P.M.	Comorn in Hungary.	Several shocks.		Cotte.
— 15.	Messina.	A violent shock.	Preceded by a noise like thunder.	Hamburger Corresp. Nr. 129.
— July 8.	Bagnères de Luchon in the Pyrenees.	Several shocks.		Palasou, loc. cit.
— 10.				
— 23.	In the Paschalik of Erzerum. Felt at Erzerum itself.	A most destructive earthquake.	The city of Arzingham (Eziningian), 15 leagues from Erzerum, was ruined, and Soliman Pasha, the new governor, all his suite but eleven, and 5000 other individuals perished beneath the ruins. Perrey, on the authority of the Mercure de France and Journal Encyclopédique, gives the date 19th July.	Hamburger Corresp. Nr. 143, 148, 149, 155; Gazette de Leyde, 14 et 21 Sept.; Merc. de Fr. 25 Sept.; Journ. Encycl. 15 Nov.



1.	2.	3.	4.	5.	6.
4. July 29. Port-au-Prince and Cap-Haïtien (François?) in St. Domingo, and Leogano in Jamaica.	In Jamaica two shocks			A hurricane occurred at the same time, both here and in Florida. Twelve houses were thrown down at the Cape (Français?), and much damage was done at the other places.	Hamburger Correspond. Nr. 171; Gaz. de Leyde, 22 Oct.; Suppl. et 5 Nov.; Suppl. Merc. de Fr. 9 et 30 Oct.; Mém. de l'Acad. de Dijon, 1784, p. 78.
— 30. In Norway	A trembling shock			Accompanied by a noise like thunder. A furious hurricane raged during the whole night.	v. Hoff.
— 31. Kingston in Jamaica	Two shocks			hurricane raged during the whole night.	de l'Acad. de Dijon, loc. cit.
— Aug. 7. Comorn in Hungary	Two slight shocks			But little damage was done. On the side of Betharram and Lourde nothing was felt.	Mercure de France, 18 Sept.; Cotte.
— 10. In the Pyrenees, at St. Marie in the Pays de Soule, and especially at Canon and Ogen.	One shock, apparently in the direction of the chain of the Pyrenees.				Palassou, loc. cit.
— 14. Langøre and Olavsvik in Iceland.	A vibratory shock lasting some minutes, and followed by 7 others of less violence thenight after.				Mercure de France, 16 Oct., 27 Nov., 3 et 8 Janv. 1785; Voyage en Islande, loc. cit.; Hamb. Correspond. Nr. 152; Cotte.
— 15. Ditto	Another shock, succeeded by more during the night.				Ditto.
— 16. Ditto	Another shock of great violence.				Ditto.
— 19. In Calabria Ulteriore	A violent earthquake (the most so in this year). The earth remained in agitation a whole hour.			Thirty large farms were ruined by these shocks. Bells rang of themselves. Clefts opened in the earth	Hamb. Correspond. Nr. 165.
— 23. At Betponey near Barèges in the Pyrenees, and also, though slightly, at Barèges itself.	A slight vibration				Palassou, loc. cit.
— 25. Neumark. ("Does this refer to the Neumark near Zwickau, to that	Ditto				Cotte, loc. cit.



**REPORTS**  
**ON**  
**THE STATE OF SCIENCE.**

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*Third Report on the Facts of Earthquake Phænomena (continued).*  
*By ROBERT MALLET, C.E., M.R.I.A.*

*Catalogue of recorded Earthquakes from 1606 B.C. to A.D. 1850.*

[Continued from Report for 1853, p. 212.]

1. ANNO DOMINI.	2. <i>Locality.</i>	3. <i>Direction, duration, and number of shocks.</i>	4. <i>Phenomena connected with the sea.</i>	5. <i>Meteorological and other phenomena.</i>	6. <i>Authority.</i>
1784. Aug. 26.	At St. Marie and Oléron in the Pyrenees.	A slight vibration			Palassou, <i>loc. cit.</i> p. 269.
— 27.	The village of Viel, a Ditto				Ditto.
Between 9, and 10 A.M.	quarter of a league, from Barèges in the Pyrenees.				
— Sept.	Island of Cephalonia.	Many severe shocks.		In Cephalonia much damage was done; but little however in St <sup>a</sup> Maura and at Argos.	Hamb. Corresp. Nr. 176.
Beginning of the month.	Also in St <sup>a</sup> Maura, and at Argos.				
— 5.	Grenoble in France.	One shock			v. Hoff.
—	Fortress of Rheinfels on the Rhine.	Two shocks.		Accompanied by a loud explosion like the report of a cannon.	Mercure de France, 20 Oct.; Cotte.
At night.		Repeated shocks	On this day, about 9 A.M., an unusual agitation of the waters of Loch Tay in Scotland was observed. The movement was from E. to W., lasted a quarter of an hour, and was accompanied by noise. The phenomenon recurred on the five following days at about the		Gazette de France, 5 Nov.; Journ. Encycl. 15 Nov.; Hamb. Corresp. Nr. 171; Biblioth. Brit. t. vi. p. 184-187; Edinburgh Transactions, vol. i. p. 200.
— 12.	Calabria Ultra.				

9 P.M.	12. Calabria Ultra.....	A severe shock .....	.....	More damage was done. "Dr. Maret, in his account of the following earthquake at Dijon, only admits this shock as real, and rejects the accounts of those on the 12th September" (Perrey quoting Mém. de l'Acad. de Dijon, 1784, p. 79).	Ditto, 6 Nov.
12 <sup>h</sup> 2 or 3 <sup>m</sup> noon.	15. Dijon, Tournus, Châlons, Autun, Charolles, Beaunçon, Lons-le-Saulnier, Geneva, and Valence. Also at Grenoble, in the valley of Graisivaudan, at Chambéry, at Bourg-en-Bresse, and at Aix in Savoy.	At Dijon rather a slight shock. The oscillation appeared to be in the direction S.E. to N.W. at most of the places mentioned; at Grenoble it was violent, and from E. to W. It was still more violent in the valley of Graisivaudan, as far as Chambéry as Bourg, and at Aix in Savoy.	.....	The weather at Dijon was calm and fine, and was not immediately altered, but in a few days it became rainy, and continued so (with some snow) for some time. Two peasants on a ladder were thrown down at the bridge of Beauvoisin. At Bourg-en-Bresse the shock was accompanied by a noise like that of a blast of wind, although the atmosphere was quite calm. At this place the barometer suddenly fell three lines, and rose immediately after the shock to its former level.	Mém. de l'Acad. de Dijon, 1784, p. 65; Gaz. de Fr. 2 Nov.; Merc. de Fr. 6 Nov.; Journ de Paris, 28 Oct.
In the evening.	17. Naples .....	Two shocks .....	.....	On the 24th Veuvius began to send forth smoke, &c.	Merc. de Fr. 27 Nov.
Nov. 9.	22. Altamura and some other places in Calabria.	Several shocks .....	.....	.....	Hamb. Corresp. Nr. 193.
Nov. 12.	9. Briançon .....	One shock .....	.....	.....	Cotte.
Nov. 12.	In the bishoprick of Spirea.	Violent shocks .....	.....	A high wall of 7 feet in thickness was thrown down at the castle of Kropfberg.	Merc de Fr. 18 Déc.
Nov. 13.	Arequipa in Peru .....	An earthquake .....	.....	.....	Cotte.
10 P.M.	29. Bourlemont, half a league from Neufchâteau (depart. Vosges), and at Clémont (depart. Haute Marne). Also Strasbourg, Bâle, Berne, and all the southern part of Alsace; and in Dan-	At Bourlemont a violent shock of a minute's duration. At Strasbourg, &c. in Alsace, several shocks, lasting 4 or 5 secs., and in the direction S.W. to N.E.	.....	The barometer was observed to fall below "stormy," not only in the region where the earthquake was experienced, but also at Paris where nothing was felt.	Mém. de l'Acad. de Dijon, 1789, p. 79; Merc. de Fr. 18 Déc., 1 Janv. 1785; Ephém. de Mannheim, 1784, p. 458; Gazette de Leyde, 21 Déc.; v. Hoff.
10 <sup>h</sup> 10 <sup>m</sup> .....	.....	.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
	pliny and Savoy, at Geneva, in the Canton de Vaud, and in Germany, over a space of many, over a space of more than 150 leagues.	Several shocks from N.E. to S.E.		Preceded by a subterranean noise.....	Merc. de Fr. 25 !Déc.; Mém. de l'Acad. de Dijon, 1784, p. 79; Cotte.
1. Dec. 3. In the valley of Graisivaudan, on the road from Grenoble to Chambéry, and in the mountains separating this valley from La Maurienne. Also at Parreaux and Allivaud.					
— 4. Prague.....		Slight shocks from E. to W.S.W.			Éphém. de Mannheim, 1784, p. 680.
4 and 5					
— 5. Neufchâteau, Roucoux, Noncourt, and Bourlemont (department Vosges).		A violent shock.....		Some walls and a house were thrown down. A violent wind arose at the time of the earthquake, and blew for thirty-six hours. The barometer fell six lines at Paris the night before. (May not this allude to the event of the 29th Nov.?)	Journ. de Paris, 24 Déc.
— 6. On the English coasts.....		Several shocks.....		Accompanied by a low noise. For some days burning vapours had been observed rising from the earth, beneath which there were deposits of coal. Very probably this is but the same event with that before given as occurring on the 9th Nov.	Cotte.
— 9. Briançon (department Hautes-Alpes).		A rather severe shock.....			Merc. de Fr. 8 Janv. 1785; Mém. de l'Acad. de Dijon, 1784, p. 79.
— 21. Calabria Ultra.....		Shocks of great violence again, lasting some minutes. Vibratory shocks.....			Gaz. de Leyde, 1785. Nr. 11, Suppl.; Journ. Encycl. 1 Mars 1785.
— 28. Around Vesuvius, and as far as Naples.				Accompanying an eruption of the upper crater of Vesuvius, which lasted until the following February, but did little damage.	Hamb. Corresp. 1785. Nr. 8 u. Nr. 44.
— Fürstenau in the county of Erbach.		Two violent shocks, lasting 1 min. each.			Merc. de Fr. 29 Janv. 1785.

4 P.M.	this.	Several slight shocks.	.....	Cotte gives the date 28th January .....	Merc. de Fr. 5 Mars ; Cotte.
Night between 23 and 24.	In various Danish islands, particularly in Sebye.	Two more shocks .....	.....	The air was calm, and it rained heavily .....	Merc. de Fr. 5 Mars ; Éphém. de Mannheim, 1785, p. 580 ; Hamb. Corresp. Nr. 30.
31. At midnight.	Klagenfurth again .....	More violent oscillations.	.....	Fresh damage done .....	Merc. de Fr. 26 Mars ; Journ. Encycl. 15 Avril ; Hamb. Corresp. Nr. 44.
Feb. 4.	In Calabria .....	Another earthquake.	.....	Buildings were again thrown down .....	Éphém. de Mannheim, 1785, p. 581 ; Hamb. Corresp. Nr. 52.
13.	Ditto .....	A slight vibration .....	.....	The Hamburger Correspondent gives the date 20th February.	Éphém. de Mannheim, 1785, p. 581 ; Hamb. Corresp. Nr. 51.
Between 7 and 8 A.M.	Lisbon .....	A violent shock at Mosdock, lasting two minutes, followed in an hour by a second of equal violence and duration, and between 7 and 8 P.M. by a feeble one. At Astracan three violent shocks.	.....	The first shock was accompanied by a subterranean noise like thunder. The second threw down the sentinels. The Éphém. de Mannheim gives the date 24th February for the shocks at Astracan.	Hamb. Corresp. Nr. 70 ; Gaz. de Leyde, Nr. 37 ; Merc. de Fr. ; Éphém. de Mannheim, p. 582.
24. 1 A.M.	Mosdock again .....	Another shock, as violent as either of the first two.	.....	.....	Ditto.
26.	Island of St. Thomas in the West India.	An earthquake .....	.....	Probably the same earthquake with one mentioned (without date) in a letter to the Hamb. Corresp. Nr. 56, dated London, 29th March, as having been felt in Barbadoes, Grenada, and Trinidad.	Hamb. Corresp. 1785. Nr. 99.
End of the month.	Paras. Also in the island of Zante.	A violent and destructive earthquake.	.....	Vesuvius was in violent eruption during the greater part of this year.	Ditto, Nr. 71 ; Gaz. de Leyde, Nr. 35 ; v. Hoff.
Mar. 17.	Messina .....	Another shock .....	.....	The few houses that remained standing before this, were thrown down. On the 13th of this month a sort of small volcanic eruption took	Merc. de Fr. 7 Mai ; Journ. Encycl. 1 Juin, 1785 ; Gaz. de Fr. 13 Janv. 1787 ; Hamb. Corresp. Nr. 70.

1.	2.	3.	4.	5.	6.
1785. April 2. 4 <sup>h</sup> 20 <sup>m</sup> A.M.	Nordenstadt near Darmstadt. Also felt at Mayence, and still more at Schelestadt. Eglsau in the canton of Zürich.	A severe shock		place in the river Majuri (provinces of Salerno) : on the 11th the river Teviot in Scotland dried up suddenly, and remained dry for two hours (the weather being very cold, and the stream covered with ice), and on the 31st at Com-motice in Bohemia there occurred a great fall of a mass of earth. There is no proof, how-ever, of any of these phenomena having been attendant on earthquakes.	Merc. de Fr. 30 Avril et 7 Mai.
Night between 2 and 3.	Mayence	A vibratory shock			Hamb. Corresp. Nr. 60; Éphém. de Mannheim, p. 586.
— 10.	Mexico, and several other districts of New Spain.	Several shocks		Probably this and the last two events occurred nearly, if not exactly, at the same time.	Hamb. Corresp. Nr. 58.
— 20.	Fiume in Italy.	Violent earthquake shocks.			Mémoires de Chron. t. ii. p. 932.
— 21.	Mont-Dauphin in Dau-phiny.	Several shocks.			Hamb. Corresp. Nr. 82; Cotte.
— 26.	Smyna	One shock			Cotte.
5 and 9 P.M.	Mont-Dauphin again	Two shocks			Hamb. Corresp. Nr. 96.
11 A.M.	Mont-Dauphin again	Two consecutive shocks lasting five to six seconds.			Merc. de Fr. 4 Juin.
— May 5.	Grenada in Spain	An earthquake of two minutes' duration.			Hamb. Corresp. Nr. 92.
Midnight.	Naples	Several shocks.			Ditto; Merc. de Fr. 18 Juin.
About half an hour after midnight.					
— 20.	Fiume in the Gulf of Venice				
Preceded by a subterranean noise. In all pro-					Gentleman's Magazine, vol. 1v.
bation the same event with that recorded on					n. 583

1819 24 and 25. June 5. 21. (Before this date.)	Velletri in Italy Calabria	A severe earthquake. The shocks continued in Calabria, according to letters of this date from Naples. The most violent shock ever known up to that time in Antigua.			At Vevey a piece of ground sank during this month, and many houses upon it. No shock mentioned. (Hamb. Corresp. Nr. 102.)	Ditto, Nr. 106. Ditto, Nr. 108.
July 11. 3 A.M.	Island of Antigua. Also in the island of St. Christopher, and Tortola.	The shocks were also felt on board the ships in the neighbourhood of these islands.			In Tortola the earthquake made great clefts in the rocks, and separated completely a part of the island, forming a new island.	Gazette de Leyde, Nr. 74; Hamb. Corresp. Nr. 153; Cotte.
12. 8 A.M.	Santa Fé de Bogota In Calabria	An earthquake More shocks, according to letters from Naples of the dates given.			Two churches were thrown down.	Hamb. Corresp. Nr. 191; Annual Register. Merc. de Fr. 13 Août; Hamb. Corresp. Nr. 128.
and 20. (At periods before these dates).						
18.	Clausemberg in the basin of the Danube.	An earthquake			During rain. The evening before, Dr. König suspected the probability of shocks from observing some considerable magnetic perturbations.	Éphém. de Mannheim, 1785, p. 603? Ditto, p. 457.
19. About 11 <sup>h</sup> 20 <sup>m</sup> P.M.	Padua	A slight shock, ending by an oscillation from S. to N.				Hamb. Corresp. Nr. 126.
23. or 25, 1 A.M.	In Upper Austria, at Steierregg, St. Georgen, Pulgarn, and other places.	Several shocks. Another, but slighter, at 6 A.M.				
26.	Triente in Italy. Also at Padua.	A rather violent shock.			Followed by heavy falls of rain, which caused inundations of the Adige and other rivers. The Éphém. de Mannheim (p. 592) gives the date 2nd August. It was remarked that this city experienced earthquakes every seventeen or eighteen years.	Merc. de Fr. 10 Sept. et 8 Oct; Hamb. Corresp. Nr. 138.
29.	Port-au-Prince in St. Domingo.	A violent earthquake.				Merc. de Fr. 1 Oct.; Gaz. de Leyde, Nr. 79, Suppl.
Aug. 6. 22. 6 <sup>h</sup> or 6 <sup>h</sup> 4 <sup>m</sup> A.M.	Payo in Spain In Moravia and Silesia. Besides the places mentioned in the next	Several shocks A severe vibratory shock. It was slight and lasted fifteen				Cotte, loc. cit. Merc. de Fr. 24 Sept. et 1 Oct.; Éphém. de Mannheim, p. 594; Hamb. Corresp. Nrs. 144, 146,



1.	2.	3.	4.	5.	6.
	column, Sorau, Misteck, Friedek, and Skotzan are mentioned.	seconds at Cracow, two minutes at Breslau, and one minute at Polesko.		shaken that the bell was struck, and sounded. The Ephém. de Mannheim gives the date 24th August, and attributes the earthquake to inundations of the Oder having undermined the ground. On this day a piece of ground sank at Jarmolin near Sanock in Poland. Irregularities of the magnetic needle were observed in Germany, both before, on, and after this day.	154; Gazette de Leyde, Nr. 66.
3. Aug 22.	In several parts of Italy.	Several shocks.			Cotte.
— 20.	Smyrnia.	A slight earthquake.			v. Hoff.
— Sept.	Briançon in Dauphny.	At Briançon 2 shocks in two minutes.	On the 6th an extraordinary rising of the sea took place at La Rochelle. No shock mentioned.	At Briançon accompanied by subterranean noise. No damage done. At Susa in Piedmont two houses fell. Some days before, the atmosphere was very hot, and full of vapours. This was the third earthquake this year at Briançon.	Merc. de Fr. 1 et 8 Oct.; Gazette de Leyde, Nr. 81, Suppl.; Hamb. Corresp. Nr. 162; v. Hoff.
— 22.	Cracow in Poland.	Three shocks from W. to E.			Merc. de Fr. 17 Déc.; v. Hoff.
A.M.					
— Oct. 1.	Rome.	Two shocks, followed by a third of more violence at 7 A.M.			Hamb. Corresp. Nr. 171.
A.M.					
—	At Linz, and at Gallneuburg, rather strong vibrations.			The walls were cracked.	Ditto.
—	places in the neighbourhood.				
—	Rome, and still more at Tivoli, Frescati, Marino, Castel-Gaudolfo, Spoleto, Rieti, and Terni, to the distance of sixty miles from Rome, upon the side of the Apennines.	Two or three violent shocks.		At the same time some drops of rain fell for a few minutes.	Ditto; Merc. de Fr. 28 Oct. et 10 Déc.; Journ. Encycl. 1 et 15 Déc.; Ephém. de Mannheim, p. 158.
P.M.					
—	Ditto. Also (on same day) but hour not stated.	Three or four shocks, lasting seven or eight minutes.		On the same day a spot of ground of 24 feet in diameter sank in the desert. Sinks at Olan in	Ditto.

— 11. Terni. Also on this day at Venice again.	was from below upwards. They were more violent, and extended further than the former. At Norcia they were followed by others at 4° 30", scarcely perceptible at Rome.	Processions were instituted in order to the cessation of these shocks.	Ditto.
— 13. Rome	An instantaneous and scarcely perceptible shock.		Ditto.
— 14. Terni and Tivoli	More shocks		Ditto.
— 15. Terni	Twelve shocks in the space of four hours.	At Pie-di-Lago (probably the centre of this disturbance) several small fumaroles opened, from which there came forth smoke and an odour of sulphur.	Ditto.
— In Thuringia; felt at Kahl, Jena, Weimar, Bürgel, and as far as Nordhausen.	A vibratory shock from S. to N.	Ended with an explosion. The atmosphere was hot, and a fire-ball was observed.	Hamb. Corresp. Nr. 176-178.
— 27. Venice	Several shocks.		Cotte.
Nov. 5. Terni again	Another shock.		Éphém. de Mannheim, p. 158, and Append. p. 80; Gaz. de Fr. 3 Fév. 1786.
— 9. Tangiers	A rather violent earthquake.		Hamb. Corresp. Nr. 208.
— 12. Terni again	Another shock	It rained in the evening	Éphém. de Mannheim, and Gaz. de Fr. loc. cit.
— Rome	A slight shock.		Éphém. de Mannheim, 1785, p. 556.
— 16. Spideberg in Norway	An earthquake shock.		Hamb. Corresp. 1786, Nr. 3.
— 22. Lisbon	A slight earthquake.		Éphém. de Mannheim, p. 158, and App. p. 80; Gaz. de Fr. 3 Fév. 1786.
— 25. Terni again	Several more shocks.	Rain during the following evening and night	

1.	2.	3.	4.	5.	6.
85, Nov. 29, Terni again About sunset.	Several more shocks.			Rain during the day	Éphém. de Mannheim, p. 158, and Append. p. 80; Gaz. de Fr. 3 Fév. 1786. Ditto.
Dec. 4, Ditto	Ditto			Rain before, during, and after the shocks	
At night.					Cotte; Hamb. Corresp. 1786, Nr. 2.
10, Clermont and Rouen in Auvergne.	A rather severe shock.				
links the 8th most probably the correct date.					
16, Terni again. Also per- ceptible at Padua.	Numerous shocks in this space of time.				Éphém. de Mannheim, and Gaz. de Fr. loc. cit.
From 8 p.m. to 3 p.m. the following day.					
20, Terni again	More shocks			It rained at this place almost every day during the month.	Ditto.
Towards Iceland the end of the year.	Many earthquakes shocks.			Accompanying a new volcanic eruption	Gaz. de Fr. 24 Fév. 1786, quoting a letter from Copenhagen of the 30th January.
Comorn in Hungary	An earthquake				Abh. der Böhmischen Gesellschaft der Wissenschaften, 1785, Abth. 1. S. 107.
Baltimore, United States	An earthquake				V. Hoff.
786, Jan. 1, Terni again	Another vibration			It rained almost the whole day	Éphém. de Mannheim, 1786, p. 496; Gaz. de Fr. 3 Mars.
2, Baltimore and Can- bridge, United States	An earthquake shock				Éphém. de Mannheim, 1786, p. 572; Cotte.
75 15 <sup>m</sup> A.M.	Ditto				Éphém. de Mannheim, p. 569.
3, Stettin					Ditto, p. 496; Gazette de France, 3 Mars.
6, Rome	A scarcely perceptible shock.				Ditto.
9 <sup>h</sup> 30 <sup>m</sup> P.M.					
15, Gubbio; eight posts from Terni, in the Romagna.	Rather smart shocks				
1 <sup>h</sup> and 8 <sup>h</sup> A.M. Terni, in the Romagna.					
about noon	A slight shock.			This month, like the preceding, was very rainy, especially towards the end.	Ditto.
Szathmar in Hungary	Some slight shocks				Gazette de France, 24 Mars.
not given					

8 P.M.	Feb. 5.	Corfu	An earthquake		According to the <i>Mercur de France</i> (13 Mai), this earthquake ruined a great part of a town and caused the death of 120 persons. No date (as to month or day) is given, but it obviously refers to this event.	Gentleman's Magazine, vol. lvi. p. 262.
5 <sup>h</sup> 30 <sup>m</sup> A.M.	12.	Reate (now Rieti) in the Romagna. Also on this day (hour not given) at Terni; and about this time at Gubbio.	A vibration at Reate. At Terni a very severe shock; and at Gubbio every day about thistime three or four shocks were experienced. How many on this day is not said.			Éphém. de Mannheim, p. 498; Gazette de France, 24 Mars.
Midnight.	13.	Albstadt (Swabia). Schreibersheim and Diversdorf.	Several shocks.			Gazette de France, 24 Mars, quoting the "rubrique" of Hamburg of the 24th February; Cotte.
	15.	Clausenburgh in Transylvania.	A violent earthquake.		Four churches were thrown down, and much damage was done besides.	Hamb. Corresp. Nr. 46; Gazette de France, 28 Mars.
1 A.M.	24.	Terni again	A slight vibration		It rained on the following days.	Éphém. de Mannheim, p. 499.
4 A.M.	27.	Very widely extended, being felt all over Upper Silesia, Poland, Hungary, Moravia, and Bohemia; principally along a line drawn from Briinn to Cracow (i. e. 35 geographical miles in a S.W. to N.E. direction). On this line it was felt at Brünn, Keltach, Schwechwitz, Schwanowitz, Misteck, Friedeck, Teschen, the Polish Ostrova, Neuhäbel, Bielitz, at Tribau, and at Cracow. Also,	Violent but not very destructive shocks. At Keltach the earth was agitated for a quarter of an hour. At Schwanowitz two shocks were felt at the hours mentioned, the second (at 4 A.M.) being the more violent. At Bielitz, two hours before, a slight shock had been felt, and another similar one at 8 P.M. the evening before. At Okolice 3 shocks		At Schwechwitz a cleft opened in a church. At Bielitz subterranean thunder was heard. At Altheida a little river disappeared suddenly. In the mines of Tarnowitz and Wialiczka nothing was felt. The weather was hot, and the air calm, but in Hungary a violent storm succeeded the shock.	At Hamb. Corresp. 1786, Nrs. 41, 43; Gazette de France, 31 Mars, 14 et 18 Avril; Éphém. de Mannheim, 1786, p. 570.
12 <sup>h</sup> midnight and 4 A.M.	4 A.M.					
4 <sup>h</sup> 15 <sup>m</sup> and 4 <sup>h</sup> 20 <sup>m</sup>						

1.	2.	3.	4.	5.	6.
4 <sup>th</sup> 15 <sup>m</sup> 4 A.M.	off this line, in Hungary at Okoltesna, Smercan, and Potur-nya; and in Bohemia at Königsgraz.	were perceived. The general direction was from W. to E.			
6. Mar. 4.	Falkenberg in the province of Halland in Sweden.	Several severe shocks.		During a season of intense cold	Gazette de France, 28 Avril; Cotte.
— 9.	In Sicily, at Patti and the district around S. Pietro, S. Tindaro, Melazzo, and Messina.	An earthquake		Part of Melazzo was very much ruined	Hamb. Corresp. Nrs. 65, 81.
— 10.	In the Palatinate, extending from Nollas to Lo-benstein.	Vibratory shocks.			Gazette de France, 7 Avril; Éphém. de Mannheim, p. 570; Cotte.
— 24.	In Arnes-Syssel, Ice-land.	An earthquake			Hamb. Corresp. Nr. 84.
— earlier.	Bonn on the Rhine.	Two shocks at these hours.		These shocks are very probably the same with the following.	Cotte.
— 11 P.M.	Bonn and the neighbourhood.	Several shocks.			Gazette de France, 21 Avril.
— April.	Milan, Liscate, and the Ditto neighbourhood.			At Liscate some old houses were thrown down.	Hamb. Corresp. Nr. 67; Éphém. de Mannheim, p. 318; Gaz. de Fr. 9 Mai.
— 7.	Padua and Bergamo. Also at Crema and Placenza.	At Padua a slight shock from N. to S. It was very severe at Bergamo. At Crema the shock was slight, but stronger at Placenza. It seems doubtful whether there was but one shock varying in intensity at the different places, or			Ditto; Hamb. Corresp. Nr. 69.
A.M. Hour not given.					

13. Milan .....	A trembling .....	.....	.....	Corresp. Nr. 79.
22. Bonn, and the adjacent 8 $\frac{1}{2}$ , 10, and some minutes past 11 P.M.	Several shocks .....	.....	.....	Cotte. Gazette de France, 16 Mai; Cotte.
May 23. Terni in the Romagna Between 1 and 2 P.M.	Another slight vibra- tion.	.....	.....	Ephém. de Mannheim, pp. 503-509.
30. Ditto, extending as far 1 A.M. and 9 P.M.	More shocks .....	.....	At Rome the shocks were perceived by everyone	Ditto.
June 1. In Iceland .....	A shock unproductive of damage.	Felt by Admiral Lö- wenörn on board his vessel in the harbour of Raskianessa.	.....	Herttha von Berghaus, B. 3. S. 703.
4. Rome and Terni .....	At Rome a slight undulatory shock, more severe in the environs of Terni.	.....	Followed by rain .....	Ephém. de Mannheim, loc. cit.
10 A.M.	Another vibration .....	.....	Ditto .....	Ditto.
13. Spoleto and all the plain between Terni and the foot of the Apennines.	More shocks .....	.....	Some damage was done at San-Gemini .....	Ditto; Hamb. Corresp. Nr. 105.
14. Terni and San-Gemini...	An earthquake .....	.....	.....	Thomson's Annals of Philosophy, vol. viii. p. 366.
16. Whitehaven, the south of Scotland, the Isle of Man, and at Dublin.	Several shocks .....	.....	.....	Ephém. de Mannheim, loc. cit.; Hamb. Corresp. Nr. 101.
30. Rome, Sabina, Monte- roborde, and other places in the States of the Church.	Shocks, continuing for several days after.	.....	.....	Gazette de France, 12 Sept.; Ephém. de Mannheim, p. 87.
July 8. Buda, Comorn, &c., from the Upper Danube to the counties of Odin- burg and Eisenburg.	One shock .....	.....	.....	Cotte.
10. St. Goar on the Rhine...	Ditto .....	.....	.....	Ditto.
22. Oren and Comorn in Hungary.	A shock of two se- conds' duration.	.....	The atmosphere was hot and calm .....	Hamb. Corresp. Nr. 120.
24. Bonn .....	.....	.....	.....	.....
12 $\frac{1}{2}$ 8 $\frac{1}{2}$ midn.	.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
5. July 30. At Flekkertord, and in the western part of Norway. 6 <sup>m</sup> A.M.		Three shocks during 2½ seconds.			Gazette de France, 26 Sept.; Éphém. de Mannheim, p. 404; Cotte.
— — — — — Rome, Ricci, Aquila, and Naples. P.M.		A shock, much more severe at Ricci and Aquilathana at Rome.		The weather was lowering all day	Éphém. de Mannheim, pp. 503–509; Cotte.
— — — — — 31. Eggra, 7 (Norwegian) miles to the west of Svalberg in Norway. A.M.		Another earthquake shock.			Gazette de France, 26 Sept.; Éphém. de Mannheim, p. 404.
— Aug. 1. Aquila again. The centre of these shocks appeared to be at Lucoli. 8.		Forty shocks during this period. On the 22nd of September they had not ceased.		At Lucoli a noise was heard like boiling under the earth.	Hamb. Corresp. Nos. 143, 151, 163.
— — — — — 5. Lisbon		A slight earthquake at Aquila.			Ditto, Nr. 148.
— — — — — 11. Whitehaven, Lancaster, a few miles before ites before A.M.		At Whitehaven several shocks were felt, lasting three to five seconds. Supposed direction = S.E. to N.W. At Newcastle two shocks were felt, with an interval of three or four seconds.		Preceded by a rumbling noise. The weather close and sultry. Barometer = 29 inches. Several buildings, chimneys, &c. were thrown down. Some people also were thrown off their feet, and birds from their perches. At some places violent rain succeeded the shock. The Annual Register gives the date 1st August, but the discrepancy manifestly arises merely from difference of style. The Hamb. Corresp. (Nos. 138, 146) records an earthquake with precisely the same details as this, on the 14th as felt at Cockermouth, Whitehaven, Workington, Maryport, Kewick, Carlisle, Kendal, and slightly in Aberdeen. The event seems certainly the same as that here recorded.	Annual Register, vol. xix. p. 38; Gazette de France, 4 Sept.; Phil. Trans. vol. lxxvii. p. 35.
— — — — — 19. Carthagona in Spain		One shock			Cotte.
— — — — — 22. Christiaustadt in Norway. (According to Kellhan, Christiansand.) A.M.		Some slight shocks			Gazette de France, 6 Oct.; Cotte; v. Hoff.
— — — — — In Upper Silesia and Moravia.		Vibratory shocks.			v. Hoff.
— — — — — 25. In the Markgrate of A		A trembling shock			Hamb. Corresp. Nr. 149.

and 14. — 22. 11 <sup>h</sup> 30 <sup>m</sup> P.M.	Rome and Terni .....	A slight shock at Rome, more perceptible at Terni.	.....	so that a pestilential smell came forth.	Nov.; Cotte. Éphém. de Mannheim, p. 507.
— Nov. 1. At night.	Terni .....	Several shocks .....	.....	It rained on the following days. From the 31st October to the 6th November Veauvius was in eruption.	Ditto.
10 <sup>h</sup> 20 <sup>m</sup> A.M.	La Rochelle in France .....	A slight shock.	.....	.....	Ditto, 1782 (?), p. 362.
Between 3 and 4 A.M.	Bale .....	Two slight shocks .....	.....	.....	Hamb. Corresp. Nr. 194; Merian.
— 25. 5 and 11 A.M.	Rome and Terni .....	At Rome slight shocks, more perceptible at Terni.	.....	v. Hoff merely mentions a shock at Rome on the 24th.	Éphém. de Mannheim, p. 507.
— 29. 4 P.M.	Cambridge, United States .....	Another earthquake shock.	.....	.....	Ditto, p. 590.
— Dec. 2. 3. 4 <sup>h</sup> 56 <sup>m</sup> P.M.	Aix in Provence .....	One shock .....	.....	At Zylo, in the county of Zips, bells sounded of themselves. At Tarnowitz some houses were injured. The air was calm. The disturbance was very strongly felt in the Carpathian Mountains. At the beginning of this month a cleft appeared in a mountain near Semlin, from which torrents of water came. No shock mentioned.	Cotte. Gazette de France, 9, 12, 19 et 26 Janv. 1787; Cotte; Hamb. Corresp. Nrs. 199, 201.
— 24. 7 <sup>h</sup> 50 <sup>m</sup> A.M.	Rimini .....	Several shocks .....	.....	Most of the houses were injured .....	Éphém. de Mannheim, p. 510; Gaz. de Fr.
— 25. 2 A.M.	Padua, Florence, Venice, Ferrara, Mantua, Pavia, Bologna, and especially at Rimini.	At Padua a very severe shock from N. to S. It was as violent at Florence, where another similar one was felt at 5 A.M. At Rimini the most violent shocks were felt, and they recurred here at intervals until the following February.	.....	At Rimini there seems to have been thunder and lightning. Snow fell very thickly there. Many buildings were thrown down at this place.	Éphém. de Mannheim, p. 510; Gaz. de Fr. 19, 26 Janv., 2 Fév. 16 Mars, et 10 Avril, 1787; Hamb. Corresp. 1787, Nr. 8, 9, 18; Cotte.



1.	2.	3.	4.	5.	6.
46. About his year.	Island of Java, particularly in the district of Batav.	An earthquake which lasted four months.		Great clefts opened in the earth, from which sulphurous vapours came out. In other places of which the river Dotog-Bach flowed, and in future followed a subterranean channel from this place. The village of Djampang was swallowed up, with eighty-eight of its inhabitants, who had not time for escape.	Horsfield, Batav. Trans. vol. viii. p. 141; Lyell's Geology.
47. Jan. 5. 7 and 8 p.m.	Edsberg in Norway.	Scarcely perceptible shocks at these hours.			Éphém. de Mannheim, 1788, p. 394.
— 6. Between 10 and 11 a.m.	Camosc (or Campsie) and Strathblane, ten miles north of Glasgow.	A pretty smart shock.		No damage done. A pair of horses attached to a carriage stopped suddenly at the moment of the shock.	Hamb. Corresp. 1787, Nr. 22; Gaz. de Fr. 9 Fév.
— 21.	Griganti and the neighbourhood of Avellino, as also at S. Marino, Italy.	An earthquake.		Did most damage at S. Marino. During the whole of this month Veauvius was more or less in a state of eruption. On the 25th the river Tevot in Scotland again (see 11th March, 1785) dried up suddenly, and remained dry for four hours; the water afterwards returning, and flowing as usual. The weather was mild.	Hamb. Corresp. 1787, Nr. 21, 23; Gaz. de Fr. 13 Fév.
— Feb. 25. A.M.	Cambridge, United States.	A slight vibration, not remarkable.			Éphém. de Mannheim, 1787, p. 350.
—	Rimini in Italy.	The shocks continued here during this month.			Gazette de France, 16 Mars, 10 Avril.
— March 3.	Florence, Rimini, Padua, and Venice.	Several shocks.			Hamb. Corresp. Nr. 48; v. Hoff.
— 14.	Acapulco.	A violent earthquake.	The sea retired as far as some rocks lying in the middle of the bay. The galeon of the Philippine Isles, which was moored in 10 fathom water, found but 4 fathoms.	The city was ruined.	Dupetit-Thouars, loc. cit. t. ii. p. 213.

24 Between 7 and 8 p.m. April 17. 1 p.m. In the morn- ing.	Radstadt, Forstau, Fla- chen, and St. Martin in the Salzburg Alps. Terni again	An earthquake		Fr. 15 Mai. Hamb. Corresp. Nr. 58.
18. In the morn- ing.	In Mexico, extending from San Luigi de Po- tosi to Oaxaca, and from Vera-Cruz to Acapulco and Valla- dolid.	A slight shock		Éphém. de Mannheim, p. 224.
		Earthquake shocks at from the S.E. At the city of Mexico the earth was in almost continual agitation for 24 hours.	At Acapulco the sea retreated far from the shore, and then returned high above its former level. From this circum- stance it seems pro- bable that the event of the 14th March has either been con- founded with, or was the same as this.	Hamb. Corresp. Nr. 137, Beil.
29 and 30. In the course of the month. May 6.	Messina In Puglia and the Abruzzo. Messina and Naples	Two violent vibratory shocks. Several shocks		Gazette de France, 5 Juin; Cotte.
		A very severe shock at Messina. Both this and the following were more violent than those of the 29th and 30th April.		Gazette de France, 8 Juin.
13.	Ditto	Another shock		Hamb. Corresp. Nr. 95.
July 6. In the morn- ing.	Penrith, Threlkeld, and Kewick in Cumber- land.	One shock		
12.	Near Vichely in the county of Sempin, Hungary.			
			During this month a cleft opened in the Hemberg near Rebshausen. No shock mentioned (v. Hoff). Some masses of rock were detached by the shock	Ditto. Gazette de France, 17 Août; Cotte.
			Two mountains were suddenly levelled. No earthquake is mentioned, and the phenome- non may have been nothing more than a great landslip.	Gazette de France, 3 Août.

1.	2.	3.	4.	5.	6.
87. July 16. Ferrara..... in the morning, and in the afternoon.	Ferrara.....	Two shocks at these two periods of the day. Both were slight.			Gazette de France, 24 Août; Éphém. de Mannheim, p. 224.
17. Braga in the province of Minho, Portugal. 2. 30 <sup>th</sup> P.M.	Braga in the province of Minho, Portugal.	A rather violent shock.		A part of the mountain of Lames d'Orillon fell on this occasion, and a chasm of 80 palms in circumference opened at Meula in Murcia. v. Hoff, quoting Cotte, gives the date 17th August.	Gazette de France, 28 Sept. et 6 Nov.
18. Around Vesuvius .....	Around Vesuvius .....	Some slight shocks.....		Accompanying an eruption of the volcano. Both Etna and Vesuvius became active about the middle of June, and on this day the disturbance was most considerable at Etna.	Gazette de France, 24 Août; Éphém. de Mannheim, loc. cit.
21. St. Pierre in Martinique..... 26. Ferrara again .....	St. Pierre in Martinique..... Ferrara again .....	A single shock..... A violent shock .....		Accompanied by a loud noise. Some houses were thrown down.	Cotte. Gazette de France, 7 Sept.; Éphém. de Mannheim, loc. cit.
Aug. 4. In the country near Ferrara..... 14. Terni again .....	In the country near Ferrara..... Terni again .....	Some shocks as severe as the last. A slight shock .....		During a terrible storm .....	Gazette de France, 14 Sept.; Éphém. de Mannheim, loc. cit.
26. Pörsseberg .....	Pörsseberg .....	One shock .....			Éphém. de Mannheim, loc. cit. See authorities for following account.
28. Stuttgart, Munich, Augsburg, Landshut, Innsbruck, Pappenheim, Ansbach, Empfen, Dillingen, and Ratisbon. Also at Zurich and Bâle.	Stuttgart, Munich, Augsburg, Landshut, Innsbruck, Pappenheim, Ansbach, Empfen, Dillingen, and Ratisbon. Also at Zurich and Bâle.	At Stuttgart 2 shocks, each of 7 or 8 seconds. They were not so severe here as in the basin of the Danube. At Innsbruck the direction was S.W. to N.E. At Munich and Ratisbon also two distinct shocks were felt. At Bâle but one shock was felt.		At Innsbruck a magnetic needle deviated 0° 12' to the east. It rained continuously there the whole day. At Stuttgart a violent wind had been blowing, but the weather was calm at the moment of the shocks.	Hamb. Corresp. Nr. 145, v. Bail; Cotte; Éphém. de Mannheim, pp. 202, 257, 266; Merian; Gaz. de Fr. 18 et 25 Sept.
Sept. 4. The city of Mexico.....	The city of Mexico.....	An earthquake of two minutes' duration.		Buildings fell .....	Cotte.

5 A.M.	25.	Rome	coming from S.W. Scarcely perceptible shocks at these two hours.			The Hamb. Corresp. gives the date 26th Sept. Ephém. de Mannheim, p. 224; Hamb. Corresp. Nr. 169.
Oct. 15 <sup>th</sup> A.M. and 2 P.M.						
Oct. 21 <sup>st</sup> before the 1st and 21 <sup>st</sup> .		Jamaica, especially at Kingston and Port-Royal.	Earthquakes are mentioned as occurring in Jamaica inlets of these dates.		At Kingston a bridge fell	Hamb. Corresp. 1788, Nr. 13 u. 14.
4 A.M.	23.	Island of St. Thomas	An earthquake, consisting of three feeble shocks.		A severe storm arose during the following night	Ditto, 1788, Nr. 18.
2 <sup>nd</sup> 20 <sup>th</sup> P.M.	27.	Montego Bay in Jamaica	Lasted ten or twelve seconds. The earth undulated slightly for some time afterwards.	The vessels in the harbour were agitated.	Preceded by a rumbling noise and concussions like distant thunder.	Annual Register, vol. xxxi. p. 3.
		Sienna	An earthquake in the course of the month.	On the 11th of this month the lake of Lugano was so violently agitated that an earthquake was suspected though none was felt. But as there was a very violent wind at the time the correctness of the supposition seems at least very dubious. (Hamb. Corresp. 1787, Nr. 179.)		Filla quotes Soldani.
Nov. 3 <sup>rd</sup> and 4 <sup>th</sup> For hours see column 3.		In the district of the Main and Neckar, at Gräfenhausen in the Black Forest, Decken-heim, Heidelberg, Mannheim, Darmstadt, Frankfurt and Hanau.	At Gräfenhausen seven shocks were felt from 8 P.M. on the 3 <sup>rd</sup> to 8 A.M. on the 4 <sup>th</sup> . At Heidelberg, Mannheim, Darmstadt, Frankfurt and along the whole route to Darmstadt, Frankfurt, and He-	At Deckenheim the motion was so violent that the bell on the Rathhaus sounded several times, and the ceiling of a room fell off.		Hamb. Corresp. 1787, Nr. 181 u. 183; Gazette de Leyde, No. 92; Cotte; Époque, 5 Août, 1846; Gaz. de Fr. 20 Nov.; Ephém. de Mannheim, 1787 (?), p. 12.

1.	2.	3.	4.	5.	6.
87. Nov. 30. after sunset.		nan, the motion was felt at 3 and 6 A.M. on the 4th. At the same hours two shocks were felt at Kleinumstadt, from E. to W. At Mannheim the direction of both wind and shocks was N.N.W. to S.S.E.			Éphém. de Mannheim, 1787, p. 226.
— Dec. 1. Light between 1 and 2.	Terni again	A slight vibration		Accompanied by subterranean noise. From the 15th to the 24th of this month Vesuvius and Etna were simultaneously in eruption.	Ditto, p. 145; Hamb. Corresp. 1788, Nr. 1, Beil.
— — — — —	Padua	Slight shocks			
— — — — —	8. Hail in the Tyrol	A slight earthquake.		The Hamb. Corresp. (1788, Nr. 41, Beil.) records an earthquake at Zante on the 20th of January, 1788. The date is in all probability a mistake, and the earthquake the same with that here reported.	Hamb. Corresp. 1788, Nr. 4.
— — — — —	Island of Zante	An undulatory shock, coming from the west.			Gazette de France, 11 Mars 1788; Cotte.
— — — — —	26. Poppi (or Pappi) in Tuscany, and the environs.	Two severe shocks		Some damage was done	Gazette de France, 1 Fév.; Merc. de Pt. 2 Fév. 1788; Cotte.
— — — — —	30. Ruini	A rather violent shock.		Much damage done	Gazette de France, 8 Fév. 1788; Hamb. Corresp. 1788, Nr. 4; Cotte.
At night.					Eyries, Nouv. Ann. des Voyages, t. xvii. Janv. 1823, p. 63.
— — — — —	The Azores	A violent earthquake.	The ocean inundated the country, and several small islands rose from the bottom of the sea, but soon after disappeared again.		
— — — — —	Tabriz in Persia	An earthquake.			Silliman's Journal, vol. xxvii. p. 351.
88. Mar. 2. Geneva		Two slight shocks			L'Institut, 29 Sept. 1842; quoting a MS. Journal of G. Ant. Deluc.
— — — — —	3. Naples. Not felt at the foot of Vesuvius itself.	A slight shock		During the eruption of Vesuvius, which had continued almost constantly since the middle of June, 1787.	Gazette de France, 1 Juillet.

way. The Hamb. Cor- resp. says in various parishes of this diocese.	A vibratory shock				Merian quotes d'Annone's and Hu- ber's Meteorol. Registers.
— 30. Bâle.....	Ditto .....			On the 10th May a piece of land sank with a terrible noise at Sunkenzoff in Bavaria. No shock mentioned. (Cotte.)	Éphém. de Mannheim, p. 326.
— 31. Geneva.....	Several shocks.....			On the 14th June the road from Bristow to Milton (in England) sank to the extent of 9 feet along a space of 30 wersts (?). Gaz. de Fr. 30 Juillet. No shock is mentioned.	Mercur de France, 2 Août.
— June. Pionsat in Auvergne ... Middle of the month.				On the 17th of July the medicinal spring at Munzingen in Baden rose to an extraordinary height, a phenomenon also observed there on the day of the great earthquake of Lisbon in 1755. No shock mentioned. (Hamb. Corresp. Nr. 127.)	Thomson's Annals of Philosophy, vol. viii. p. 367.
— July 8. Isle of Man .....	A shock of earthquake	On the same day the sea suddenly re- ceded at Dunbar.		The wind was very stormy both before and after the shock.	Gazette de France, 26 Sept.; Cotte. Hamb. Corresp. Nr. 139.
— Aug. 2. Stavanger in Norway ... 11 <sup>h</sup> 30 <sup>m</sup> A.M.	A severe shock from S. to N.				
— 12. In the forest of Hun- drück, between the Rhine and Moselle.	A severe earthquake				Éphém. de Mannheim, p. 101.
— Oct. 5. Rome, Albano, and the 10 <sup>h</sup> 45 <sup>m</sup> P.M. neighbourhood.	A slight vibration				
— 12. Island of St. Lucia in the West Indies.	An earthquake			900 persons perished during this earthquake	Mémorial de Chronol. t. ii. p. 932.
— 20. Tolmezzo in the Vene- 10 <sup>h</sup> 30 <sup>m</sup> P.M. tian territory.	A severe earthquake			Seven houses were thrown down, and thirteen others violently shaken. The "Montes For- julenses" were shaken, and on the 11th (or 21st?), at 7 A.M., a slight shock was felt "in montibus Taurinjanis." v. Hoff records the earthquake at Tolmezzo on the 10th, and says that forty houses were destroyed by it.	Gazette de France, 28 Nov.; Éphém. de Mannheim, p. 370; Cotte; Hamb. Corresp. Nr. 189, Beil.
— 29. Darnstadt .....	A severe shock from S. to N.				Gazette de France, 18 Nov.
— About 11 P.M. — Nov. 18. Lisbon and Cintra. Also 2 A.M. slightly felt at Quelus.	Some slight vibrations at Lisbon; stronger at Cintra.			Accompanied at Cintra by subterranean noise ...	Hamb. Corresp. Nr. 206; Gaz. de Fr. 19 Déc.

1.	2.	3.	4.	5.	6.
8. Nov 22. between 11½ a. and on.	Ofen (Buda) and Essek in Hungary.	Several vibratory shocks.			Gazette de France, 19 Déc.; Merc. de Fr. 20 Déc.; Hamb. Corresp. Nr. 199.
— Dec. 18. A.M. and a little before P.M.	Aarhaus in Norway Mayence, Frankfurt, and the neighbourhood.	A vibratory shock Two shocks at the hours mentioned respectively.		Keilhan places this event on the 8th The day after snow fell, and a thaw began, but on the 26th the wind returned to the north, and the cold set in again with much severity.	Cotte. Gazette de France, 20 Janv. 1789; Cotte.
— At the id of this ar, or be- ning of e follow- g one.	Carlowitz in Hungary...	An earthquake		Houses were thrown down	Hamb. Corresp. 1789, Nr. 14.
9. Jan. 18. P.M.	Mayence, Frankfurt, Ep- stein and Solms-Lau- bach; and more feebly at other places, as Cologne, Giessen, and Erlurt.	Several shocks			Gazette de France, 10 Fév.; Hamb. Corresp. Nr. 15, Beil, u. 17; Cotte; v. Hoff.
— 20. little be- re noon.	Mayence	Another shock			Ditto.
— Feb 7. 35 <sup>a</sup> P.M. P.M. in Ca- bria.	Messina, and in Calabria At Messina Ultra, especially at Monte-Leone and Reggio.	At Messina 2 shocks, the first very severe. They were undula- tory, and from E. to W. In Calabria Ultra three were felt.			Gazette de France, 10 Avril; Hamb. Corresp. Nr. 42; Cotte.
— 27. Mar. 31.	Presburg in Hungary the places around.	An earthquake Ditto			Hamb. Corresp. Nr. 41. Ditto, Nr. 62.
— May 5. A.M.	Barnstaple in Devon- shire.	An earthquake shock from E. to W., last- ing one minute.		Accompanied by a rumbling noise	Gentleman's Magazine, vol. lix. p. 437.
— 17.	Plauen on the Havel in Saxony.	Two vibratory shocks		Some floors were cracked	Gazette de France, 30 Juin; Cotte.

		five minutes at rest.			
					Voyage en Islande, v. Hoff.
9 A.M.	Barèges in the Pyrenees	One shock			made their appearance near Reiknum, between the rivers Thoraa and Hufaa. The level of the surface was in many places altered, particularly around the lake Thingvallvatn, which became dry in places where formerly it was 12 feet deep, and on the contrary, on its eastern side, spread itself over its former shore.
9 <sup>h</sup> 58 <sup>m</sup> P.M.	13. Mannheim	Two pretty severe shocks from N.E. to S.W., rapidly succeeding each other.			Palassou, <i>loc. cit.</i> p. 269.
Between 11 and 12 (A.M. or P.M.?)	16. Mannheim and Oggersheim.	A vibratory shock			Gazette de France, 3 Juillet; Hamb. Corresp. Nr. 101; Cotte.
9 <sup>h</sup> A.M.	Barèges in the Pyrenees again.	Another shock			Hamb. Corresp. Nr. 105, Bell.
July 27. 15 minutes past noon.	Adorf in the Voigtland.	Three shocks at intervals of five minutes. The first, the most severe, lasted one minute. Direction = N.W. to S.E.			Palassou, <i>loc. cit.</i>
Aug. 4 and 5.	Padua	Violent vibrations			Gazette de France, 28 Août; Hamb. Corresp. Nr. 125, Bell; Cotte.
26. 9 <sup>h</sup> 30 <sup>m</sup> A.M.	Planen in the Voigtland	A severe shock from E. to W.			Hamb. Corresp. Nr. 137.
	Pekin in China	An earthquake			Gazette de France, 6 Oct.; Cotte.
	Lisbon	A severe oscillation			Cotte.
Night between 27 and 28.					Hamb. Corresp. Nr. 164.
Sept. 2.	Courie in Perthshire	Two shocks on this day.			Edinburgh Trans. vol. iii. p. 240.
26. At night.	Wenlock in Shropshire.				Gentleman's Magazine, vol. lx. p. 947.



1.	2.	3.	4.	5.	6.
9. Sept. 30. In Tuscany, the States of the Church, at Borgo-S.-Sepolero, a violent shock, lasting two minutes. It was feeble at Florence, but again severe at Castello.		At Borgo-San-Sepolero a violent shock, lasting two minutes. It was feeble at Florence, but again severe at Castello.		The earth opened near Borgo-San-Sepolero, and houses with men and cattle were swallowed up. The little town of Sorei, lying between Castello and Florence, was completely ruined.	Hamb. Corresp. Nr. 167; Cotte; Gaz. de Fr. 3 et 27 Nov.
— Oct. 28. Edinburgh Berne in the Black Forest. v. Hoff, this should probably be in the Fichtelgebirge.)		One shock Some earthquake shocks.		After a brilliant flash of lightning.	Cotte. Berlinische Nachrichten von Staats- und Gelehrten Sachen, 1789, Nr. 138.
— Nov. 5. Cromarty and Crieff in Scotland. — 10. Comrie in Perthshire — 11. Ditto		A shock from S.E. to N.W. Repeated shocks Another shock		Attended by a rumbling noise Accompanied by a hollow rumbling noise. A pond in the neighbourhood had the sheet of ice with which it was covered shattered to pieces. On the 13th of this month the mountain of Willach in Upper Carniola separated into two after several days' rain. No earthquake mentioned. (Gaz. de Fr. 1 Janv. 1790.) The town of Novo-Castello and several villages were overwhelmed.	Cotte; Thomson's Annals of Philosophy, vol. viii. p. 367. Edinburgh Trans. loc. cit. Thomson's Annals of Philosophy, vol. viii. p. 367.
Dec. 24. Calabria					Mém. de Chronol. t. ii. p. 332.
— 29. Comrie in Perthshire 1. Jan. 2. Théis, in the mountains, four leagues from Grenoble.		More shocks A violent shock			Edinburgh Trans. loc. cit. Gazette de France, 26 Janv.
— 10. Ancona and 14.		Shocks on these three days.			v. Hoff.
— Feb. 27. Village of Arnside in Westmoreland.		A violent shock		Accompanied by an explosion louder than thunder. At daybreak two clefts were found in the earth, one of which was very deep and 200 feet in length. Six houses and many cattle had sunk into it. The other chasm was smaller, and distant a league from the former. The motion of the sands lasted several hours. The Gazette de France places this event on the	Moniteur, 2 Avril; Hamb. Corresp. Nr. 43.

1790. Mar. 1.	Torres-Vedras in Portugal.	A rather violent shock, but of short duration.			Gazette de France, 27 Avril.
— 5.	Griesheim in Darmstadt	Two severe shocks at these hours.			Ditto, 2 Avril; Hamb. Correspond. Nr. 45.
8 and 11 P.M.					Ditto.
— 6.	Ditto. Also felt at Darmstadt and in the Odenwald.	Another shock, of greater violence than the two former.			
4 A.M.					
— 13.	Breslau	A vibratory shock			V. Hoff.
— 18.	S. <sup>a</sup> Maria di Nicemi near Terranova in Sicily.	Seven ditto. The sinking of the piece of land lasted until the end of the month.			Accompanying the gradual sinking of a piece of land of three Italian miles in circumference to the depth of 30 feet. From fissures in this spot, petroleum, sulphur, various vapours, hot water, and finally a stream of salt mud issued. Several houses fell, and considerable atmospheric disturbance was perceived. On the 31st of this month, at 8 A.M., the mountain Scylla fell into the sea, which was much agitated at the distance of two leagues. (Moniteur, 25 Avril; Gazette de France, 4 Mai; Cotte.)
—	Malta				Accompanied by a noise like the discharge of a thousand muskets. The atmosphere was calm. At Roman, Jassy, Kaminiack, Bucharest, Ocza-kow and Zycomierz, more or less damage was done to buildings, &c.
— April 6.	The Baunat, all Transylvania, Volhynia, the Eukraïne, as far as Constantinoale, and the Crimea. The district shaken was comprehended by a line extending from Dubno in Volhynia (the most northern locality), towards the west to Brody and Lemberg in Galicia, more to the south, to Hermannstadt and Shuppaneck in the Bannat, and as far as Constantinoale (the southern limit). To the east, from Dubno to Berdiczow, Kiew, Niemirow (in	A violent earthquake, the shocks lasting about five minutes, and being followed by some more during the night. At Bucharest they only lasted 11 to 14 seconds. The direction of the shocks was in general S. to N., except at Niemirow, where they seemed to follow the course of the Bug, which flows to the S. and W. of the town.			Ditto, 16 Mai; Gaz. de Fr. 21 Mai; Hamb. Correspond. Nr. 67, Beil. Nr. 69 u. 84.
9 <sup>h</sup> 29 <sup>h</sup> P.M.					

1.	2.	3.	4.	5.	6.
90, May ...	Podolia), Tulcayn, Bender, Oczakow, Cherson, and throughout the Crimea (the most eastern region). In the Val-di-Noto in Sicily.	An earthquake		Catanesetta was greatly injured, and Palombina built upon a promontory of tufa, sank into the sea. An eruption is reported to have occurred at one spot.	Hamb. Corresp. Nr. 91, Beil.
— June 10. A.M.	Ancona	A violent shock		The Hamb. Corresp. records this earthquake on the 9th.	Gazette de France, 20 Juillet; Moniteur, 23 Juillet; Hamb. Corresp. Nr. 111, Beil.
— — 12. (A.M. or P.M.?)	Ditto	Another similar shock			Ditto.
— — 14. Ditto		Ditto; still more violent than the two former.		Almost at the same time with these shocks others were felt in the Calabrias, the first of which were followed by terrible storms with thunder. In all probability the shocks given by v. Hoff on the 16th, 12th and 14th of January are merely the same with these, and the earlier date erroneous.	Ditto.
— July ... (light between 3 and 4.	Constantinople	Two shocks			Hamb. Corresp. Nr. 136.
— — 4. Bâle		A vibratory shock			Meteorol. Registers of d'Annone and Huber.
— — 26. Pontremoli		A severe earthquake		Many buildings were injured. Vesuvius was in a state of energetic eruption about this time, according to letters from Naples dated the 28th. A piece of forest land (resting on granite) between the villages of S. Pedro de Alcantara and S. Francisco de Arpao sank 80 or 100 ft., and produced a lake of 400 toises in diameter.	Hamb. Corresp. Nr. 135.
— Sept. 21. At the mouth of the river Cauca where it flows into the Orinoco, in the province of Caracas, S. America.		A violent earthquake.			Humboldt, Relat. Hist. t. ii. p. 639; Huot, Géol. t. i. p. 112.
— Oct. 8. On the south coast of Spain and north of Africa, especially the country about Oran;		Simultaneous shocks on the opposite coasts. At Oran twenty shocks were	At Carthage the sea was so much agitated that the persons employed	At Oran great damage was done to the fortifications and city, and some lives were lost. At Santa Fe in Spain considerable destruction of property likewise ensued, several houses	Hamb. Corresp. Nr. 180, 182, 184; Cotte, Moniteur, 2 Nov. et 21 Déc.; Gaz. de Fr. 9 Nov.

1790. Oct. 13. Terni in the Romagna.....	edly up to the 25th. At Malta but one slight shock was felt.			Hamb. Corresp. Nr. 181, Bail.
— — — 28. In Calabria Ultra .....	Numerous shocks .....			Ditto, Nr. 197.
— — — .....	Three earthquakes during this year.			Ditto, Nr. 183.
— — — or 1791. In the valley of Maurienne (department Mont Blanc) .....	Several shocks .....			Communication of Mr. Alexis Billet to M. Perrey.
1791. Jan. 24. Darmstadt .....	A slight shock, followed by another at 4 A.M. the following morning.			Hamb. Corresp. 1791, Nr. 22.
— — — Bad Aquila in Italy .....	Numerous vibratory shocks.		Some old houses were thrown down .....	Ditto, Nr. 32.
— — — of the month.	Shocks were still felt during the month, according to letters from Naples of the date given.		A frightful storm had occurred at Catania, followed by earthquake shocks.	Ditto, Nr. 44.
— — — Feb. Be-fore the 22nd.	On the 2nd of this month the tide in the Thames rose two hours before its regular time and lasted so nearly eight hours. The water rose 3 feet higher than usual, a phenomenon which had not been known to happen for thirty years before. No earthquake, however, is spoken of (Hamb. Corresp. Nr. 27.)			Edinburgh Encyclopedia, Article Chronology.
— — — Between March and July.	Several shocks .....			

1.	2.	3.	4.	5.	6.
1. April 4, Kamtschatka .....		An earthquake on these three days.		The volcano Klutschewskoi sent forth smoke only.	Hoff.
2. May 6, Ditto .....		Another earthquake ..			Ditto.
3. May 16, East Haddam, Conn. ....		Two shocks in quick succession, of which the first was the more violent. Followed soon after by a third, slighter than the former, and by nearly one hundred still feebler shocks during the night.		At Killingworth at the time of the shock the fish leaped out of the water in every direction. The atmosphere was very clear and warm; and the moon almost full, and remarkably brilliant. Subterranean noises are constantly heard at East Haddam, whence its Indian name, Morehemodus, or the place of noises. After this shock, both noises and shocks became less frequent.	Silliman's Journal, vol. xxix. p. 338.
4. M. ....	Philadelphia, United States. Also felt at various other places in the eastern States; particularly at New York.	A slight vibration ..			Hamb. Corresp. Nr. 128; Moniteur, 23 Août.
5. May 17, 34 <sup>m</sup> A.M. ....	Dijon .....	Two distinct shocks like explosions in the space of three seconds. A lamp appeared to oscillate from E. to W.			Lettre de Guyton-Morveau à Lande; Moniteur, 23 Mai; Gaz de Fr. 31 Mai.
6. May 18, night. ....	East Haddam, Conn. ....	Six more shocks during the night.		The night very fine.	Silliman's Journal, loc. cit.
7. May 18, 3 <sup>m</sup> P.M. ....	From Boston to New York.	A severe shock, followed by a slighter one, the latter being only felt at Hartford. During the night twenty or thirty more were felt. At Middle Haddam the first shock was severe and from W. to E.		Some damage was done. In the morning cliffs were observed in the ground, and it was found that stones of several tons weight had changed their places. Probably the date of the shock at Philadelphia should be 18th instead of 16th.	Ditto.

1791. May 21. Turin ..... 1 A.M.	.....	.....	.....	.....	The evening before a reddish halo had been observed surrounding the sun, which phenomenon was considered by many there as a sign of approaching earthquakes.	Hamb. Corresp. Nr. 96.
— July 8. In the Pyrenees, particularly violent in the commune of St. Marie. 3 A.M.	.....	.....	.....	.....	.....	Palassou, <i>loc. cit.</i> p. 269.
— Aug. 15. Tivoli and Frascati in the States of the Church. .....	.....	.....	.....	.....	.....	Cotte.
— 29. Pressburg in Hungary Between 4 and 5 P.M.	.....	.....	.....	.....	Accompanied by a terrible storm, which overthrew buildings, and did great damage in the forests.	Moniteur, 27 Sept.; Gaz. de Fr. 30 Sept.; Hamb. Corresp. Nr. 150.
— Sept. 2. Lyons in France ..... .....	.....	.....	.....	.....	.....	Cotte.
— 27. Comrie in Perthshire ..... In the island of Jersey. .... 9 P.M.	.....	.....	.....	.....	Accompanied by a subterranean noise like the rolling of carriages. The evening was fine and starlight, and the wind soft, from the east. For many weeks great heat and drought had prevailed.	Edinburgh Trans. vol. iii. p. 240. Hamb. Corresp. Nr. 169.
— Oct. 11. Foligno, Spoleto, Tolerino, and other places in the States of the Church. And at Rome itself.	.....	.....	.....	.....	At Foligno, Spoleto, &c. many houses were thrown down. At Rome no damage was done.	Ditto, Nr. 180 u. 181; Gaz. de Fr. 18 Nov.
— 13. In the province of Capri (should probably read Island of Capri).	.....	.....	.....	.....	Much damage done to houses, &c. ....	Hamb. Corresp. Nr. 184; Gaz. de Fr. <i>loc. cit.</i>
— 14. In the parts of the States of the Church shaken on the 11th.	.....	.....	.....	.....	.....	Hamb. Corresp. No. 180 u. 181; Gaz. de Fr. <i>loc. cit.</i>
— 28. In England ..... — 29. Oran in Africa ..... — Sicily, Calabria, and Turkey. During this month.	.....	.....	.....	.....	.....	Cotte. Hamb. Corresp. Nr. 189. Gaz. de Fr. <i>loc. cit.</i> ; Mém. de Chronol. <i>loc. cit.</i>

1.	2.	3.	4.	5.	6.
1. Nov. 27. Lisbon ..... 20 <sup>m</sup> P.M.		A rather severe earthquake, consisting of two shocks. The first was merely five or six vibrations succeeding one another so rapidly as to be scarcely distinguishable. The second and more violent shock was undulatory, and occurred about five minutes after the former.		The second shock was attended with a hissing noise like that of red-hot iron quenched in water, and ended with an explosion like the report of a cannon. The bells in one of the churches rang out loudly.	Annual Register, vol. xxxv. p. 3; Hamb. Corresp. 1792, Nr. 4.
- Dec. 2. Island of Zante .....		A violent shock followed by others up to the 18th.	The most violent agitation occurred in the strait between Zante and the Morea.	The first shock threw down many houses, amongst others that of the Austrian Consul-General. A storm of rain, thunder, and lightning raged at the same time.	Hamb. Corresp. 1792, Nr. 5, Beil.
— In St. Paul's Bay in the month of May not far from St. Lawrence (about sixty miles N.E. of Quebec), Canada.		Severe shocks .....		Walls were cracked, and stones fell from the houses.	Lyell's Geology (3th ed.), vol. ii. p. 208; Trans. of Roy. Geol. Soc. (London), 2nd Series, vol. v. p. 97 (note).
! Jan. Be-Beja in Alentejo, Portugal.		Several vibrations .....		Accompanied by subterranean noise .....	Hamb. Corresp. Nr. 8.
— 22. Island of Martinique .....		A rather violent earthquake.			Journal des Mines, Nr. 18, p. 58.
Feb. Be-Be-In some regions in Nor-Subterranean commotion of way.				Great cold on the 13th and 15th of this month. On the former day, at noon, much lightning and thunder.	Merc. de Fr. 31 Mars.
— 23. In Lincolnshire .....		Shocks in the direction S.W. to N.E.			Phil. Trans. 1792, p. 283; v. Moll, Annalen, Th. 2, S. 431.
Mar. 1. In Bedford, Leicester, Lincoln, Nottingham, and other counties.		A rather severe earthquake, consisting of a tremulous motion.		In Brewster's Encyclopedia, loc. cit., the date 2nd March is given.	Annual Register, vol. xxxv. p. 10; Brewster's Encycl. Article Chronology; Mém. de Chronol. t. ii.



# ON THE FACTS OF EARTHQUAKE PHENOMENA.

Nov. 7. In Algiers — 9. Bale.	At the hour mentioned, at Stamford and Doncaster.	An earthquake A vibratory shock	and lasting several seconds.	..... ..... .....	..... ..... .....	p. 932.  Hamb. Corresp. Nr. 72. Meteor. Reg. of d'Annone and Dan. Huber. Ferrara, Descrizione dell' Etna, p. 131.
— ring the ath.	Etna.	More violent shocks than had been felt here for several months, during which time the volcano had not ceased trembling and sending forth smoke.	One shock	.....	.....	.....
April 3. Palermo	.....	More than thirty shocks during the day; all of them, however, being slight.	.....	.....	No damage done	Hoffmann in Poggenдорff's Annalen, B. 24. S. 54. Spallanzani, Voy. dans les Deux Siciles, t. iv. p. 109.
May 10. Messina	.....	Very violent shocks, followed by innumerable others about Etna itself for a whole year.	.....	.....	.....	.....
— 11. Ditto	.....	On the 21st of this month the sea rose at Sandvort in Holland higher than had ever been known before, and then sank suddenly again, the whole taking place in a few seconds. No shock mentioned. (Hamb. Corresp. Nr. 84.)	.....	Accompanying a most violent eruption of Etna, which continued with more or less energy until May 1793.	.....	Ditto; Ferrara, Descrizione dell' Etna, p. 131-137.
Aug. 28. East Haddam, Conn., — M. United States.	.....	Three shocks	.....	.....	.....	.....
Nov. ... Sienna	.....	Another earthquake	.....	.....	.....	.....
				Subterranean noises were heard at 10 p.m. The weather was very fine. Perrey gives the date 24th October.	.....	The Stillman's Journal, vol. xxxix. p. 338.  Pilla quotes Soldani



1.	2.	3.	4.	5.	6.
.....	Kiachta and Troitsko, Sakks.	An earthquake .....	.....	Produced the greatest consternation among the inhabitants.	.....
.....	Comrie in Perthshire .....	Several shocks during the year.	.....	.....	Thomson's Annals of Philosophy, vol. viii. p. 367.
.....	Jan. 1. Christiansand in Norway.	Another vibration .....	.....	Keilhau marks the year with (?) query, as if not certain of that part of the date.	Keilhau, <i>loc. cit.</i>
.....	11. East Haddam again .....	Another vibration .....	.....	Accompanied by noise. The weather warm and fine.	Silliman's Journal, vol. xxxix. p. 338.
.....	Mar. 1. In the Japanese island of Kion-Siou, particularly in the province of Simabava.	A frightful earthquake .....	.....	The earth opened in chasms, masses of rock fell from the mountains, men could hardly remain standing, &c. Preceded in January and February by volcanic eruptions in Japan and the Kurili Islands, and followed on March 2 by an eruption of Tuxtla in Mexico which lasted until November (v. Hoff).	Tising, Illustrations of Japan (translated from the Dutch by F. Schöbert), London, 1822; Humboldt, <i>Fragmens Asiatiques</i> , t. i. p. 220.
.....	April 1. Around the volcano Illigigama in Japan.	An earthquake .....	.....	Accompanying a violent eruption of this volcano, from which a vast stream of water burst forth, destroying 53,000 men (!).	Ditto.
.....	5. Hermannstadt in Transylvania.	Two vibrations rapidly succeeding each other.	.....	.....	Hamb. Corresp. Nr. 69, Heil.
.....	St. Domingo .....	An earthquake .....	.....	More than thirty houses were overthrown .....	Edinburgh Encyclopedia, Article Chronology; Moniteur, 12 Août.
.....	June 9. Lisbon .....	A slight earthquake .....	.....	.....	Hamb. Corresp. Nr. 118.
.....	July 6. East Haddam again .....	Another vibration .....	.....	Weather very warm. Rain and thunder after the shock.	Silliman's Journal, <i>loc. cit.</i>
.....	30. At Irkutsk. Also felt by Laxmann at the distance of 120 wersts from that place. (In what direction?)	An earthquake .....	.....	.....	Nova Acta Acad. Imp. Petropol. vol. ii. p. 10.
.....	Sept. 28. Salisbury and Shaftesbury.	An earthquake shock from S.W. to N.E., lasting two seconds.	.....	Attended by a rumbling noise. The weather very calm, and what wind there was easterly.	Gentleman's Magazine, vol. lxxiii. p. 950.
.....	Nov. 29. Lisbon .....	A severe shock of 42 secs. duration.	.....	Followed by abundant rain .....	Moniteur, 10; Ventôse, an. 2.
.....	Dec. 8. Kieff in Russia .....	An earthquake .....	.....	.....	Nova Act. Acad. Imp. Petropol. vol. xv; Hist. p. 71.

1793. Dec. 8.	In Transylvania	A severe vibratory shock.	Accompanied by a violent rattling noise	Hamb. Corresp. 1794, Nr. 2.
— 12.	In Hesse Darmstadt	A vibratory shock	High buildings were thrown down at Coupang.	Ditto, 1793, Nr. 205, Bell.
— 1794. Feb. 6.	Island of Timor	An earthquake	At Grätz buildings were thrown down, as also in the Mürzthal, where a subterranean noise like thunder was heard. At Leoben most damage was done.	v. Hoff. Hamb. Corresp. Nr. 28, Bell, Nr. 31 u. 35.
— or 7. 1 P.M.	Vienna and in Styria.	Ditto. At Vienna it lasted eight seconds.		
— 1794. Feb. 6.	Near Vienna it was strongest in the parts lying next the Danube, and at Brünn. The central point of this earthquake, where it was most strongly felt, was Leoben.	At Leoben oscillations were felt on the 8th and 9th.		
— March 7.	At the city of Mexico.	Shocks at both these hours, the first oscillatory, the second a sort of heaving motion from beneath.		Sonneschmidt, Mineralog. Beschreib. der vorziigl. Bergw.-Reviere von Mexico, 1804, S. 323.
— 4 and 11 P.M.	Palermo	One shock		Hoffmann in Poggendorff's Annalen, B. 24, S. 54.
— 9.	East Haddam, Connecticut.	Two shocks, followed by a third at 11 P.M.	The atmosphere was clear in the morning, hazy and damp in the afternoon.	Silliman's Journal, vol. xxxix. p. 339.
— 2 P.M.	Casan	An earthquake	The town was ruined.	Mém. de Chronol. t. ii. p. 932. Hamb. Corresp. Nr. 86, Bell.
— May 12.	Inspruck	One shock	Followed on the night of the 13th by the most tremendous eruption of Vésuvius since those of 1779 and 1631. For details, vid. v. Hoff.	Hamilton in Phil. Trans. 1795; Breislak and Winspeare, Memoria sull'eruzione del Vésuvio accaduto la sera del 15 Giugno, 1794; Napoli, 1794; Gilbert's Annalen, B. 4 u. 5; v. Moll, Jahrbücher, &c. B. 1. S. 322. B. 5; v. Buch, Beobacht. auf Reisen, B. 2. S. 104; Moniteur, 4 et 15 Thermidor, 24 Messidor et 6 Fructidor, An. 2; Audot, Roy. de Naples, p. 69, &c. &c.
— 11½ P.M.	Naples, Caserta, throughout Campania, and at Benevento and Ariano in Apulia. Especially violent at the foot of Vésuvius.	A very violent earthquake, with wave-like oscillations from E. to W.	The eruption proper lasted until the 22nd, and was followed by violent rains accompanied by lightning, until the 7th July.	
— Night between 13 and 14.	All the country around Vésuvius.	Numerous violent shocks.	At Naples houses were thrown down. Torre-del-Greco was buried beneath the lava (according to v. Hoff, on the night of the 15th).	Torre-Ditto.

1.	2.	3.	4.	5.	6.
June 15. At the country around 10 and 11 Vesuvius.	Numerous violent shocks. The motion very irregular.			The eruption continued with the greatest violence, several new fissures opening, and lava streams issuing from them. About midnight the volcano became quieter. The weather was calm; the sky a little clouded. Olivier, Voy. dans l'Empire Ottoman, t. i. p. 129.	Authorities quoted above (on the 12th).
— 16. Bay of Buda on the Bos. A slight shock.					
11 A.M.					
— 17. Vesuvius and all the country round.	A tremendous shock.			Accompanied by a noise like thunder. At the same time the greater part of the crater fell in, and the mountain thereby lost 454 Parisian feet of its height.	Authorities quoted above (on the 12th).
July 3. In Turkey	An earthquake				Edinburgh Encyclopædia, Article Chronology.
Aug. 12. Palermo	Ditto				Hoffmann, <i>loc. cit.</i>
Sept. 3. Ditto	Ditto				Ditto.
Oct. 11. Kingston in Jamaica. A violent shock still more severe in the other parts of the island.					Moniteur, 29 Nivôse, An. 3.
— 28. At Canea in the island of Candia	Moderate shocks, lasting some seconds.			It was calm at the moment of the shock, but soon after the wind began to blow from the west, and continued in that quarter for some days. Earthquakes are not uncommon at this place.	Olivier, <i>loc. cit.</i> t. ii. p. 298.
— In Canea, S. America. An earthquake					Humboldt, Voyage (4to ed.) t. i. p. 307.
Jan. 2. Currie in Perthshire	An apparently perpendicular shock.				Gentleman's Magazine, vol. lxxv. p. 74.
Apr. 29. Constantinople	Slight shocks				Moniteur, 1 Juillet.
Sept. 23. At Ober-Cassel near Bonn.	A trembling shock				Kastner, Archiv für Physik, B. 3. S. 362.
Nov. 18. In England, extending from Leeds to Bristol and from Norwich to Liverpool.	Vibratory, from S.W. to N.E.			The wind had been S.W., and afterwards changed to N.W., followed by rain and suffocating heat. The motion of the earth was accompanied by a subterranean rolling noise. At Derby a fire ball, and at other places a luminous streak were observed in the heavens. The workmen in the Gregory mine at Ashover heard an ex-	Phil. Trans. 1796, p. 353; Gilbert's Annalen, B. 4. S. 59; v. Moll's Annalen, B. 2. S. 431.

1795. Dec. Daynot given. 2 <sup>d</sup> 10 <sup>m</sup> P.M.	Aleppo.....	Two shocks, the second being the more severe and rapidly succeeding the other. Apparent direction = N. to S.	.....	plosive noise, and perceived a blast of wind in the upcast shaft. At Kenilworth the barometer fell from 30-28 in. to 28-8 in. between the morning of the 17th and the evening of the 28th. The Annual Register (vol. xxxviii. p. 64) gives the date 23rd November, a little before 11 P.M., for Birmingham and the country round; and the Bibliothèque Britannique (t. i. p. 124) reports it on the 28th Oct. at 11 <sup>h</sup> 5 <sup>m</sup> P.M., mentioning a number of places where it was felt. Houses were cracked .....	Olivier, loc. cit. t. vi. p. 360.
— .....	In the province of Simabara, island of Kian-Siou, Japan.	An earthquake .....	.....	55,000 men lost their lives on this occasion. Is not this merely a confusion of the two accounts of March 1 and April 1, 1793? They all, probably, refer to the same event. In this year a new volcanic island seems to have risen from the sea in the Aleutian group, off the coast of Kamtschatka. No shocks are mentioned at this time, though later such were felt in Unashchka (v. Mell's Neue Jahrbücher, n.s.w. B. 2. S. 382).	Titaing, Illustrations of Japan.
1796. Jan. 10. — 17.	Lisbon ..... Ditto .....	A severe shock Another .....	.....	.....	Hamb. Corresp. Nr. 41; Cotte. Ditto; Mém. de Chronol. t. ii. p. 932.
— 27. In the morning.	Ditto .....	Ditto, so violent that it was thought a second similar one would have destroyed the city. The earth shook up to the 21st February.	.....	For some time storms had been experienced here, accompanied by extraordinary rains.	Hamb. Corresp. and Cotte, loc. cit.; Moniteur, 20 Germinal, An. 4.
Feb. Night between 4 and 5.	Florence, and more violently at Arezzo.	A rather severe shock, much more violent than at Arezzo, where it was succeeded by others.	.....	Chimnies and some buildings were destroyed ...	Moniteur, 15 et 17 Ventôse, An. 4; Cotte.

1.	2.	3.	4.	5.	6.
Feb. A In Canada before r. 6.	A violent shock			Some of the rocks of the Falls of Niagara fell. The letter, dated Neward in Upper Canada, Mar. 6, says "lately" as to the date of this event.	The Bibliot. Britann. t. ii. p. 86; Keferstein.
March 3 Urm	A vibratory shock				Hamb. Corresp. Nr. 46.
4. April 20. Baile.	Ditto				Meteor registers of d'Annone and Huber.
— 26. In Asia Minor, especially at Latakiah (Laodicæa). 9 A.M.	A most destructive earthquake. The first shock, which was the most violent, and that which overthrew the houses, raised the surface of the ground several toises. The others were horizontal, and seemed to pass in the direction E. to W., i. e. from the land towards the sea. They lasted nearly a minute, diminishing in force from first to last. Two months after, slight tremblings and subterranean noises were perceptible.	The sea was perfectly calm.		The air was quite still, and the sun had a pale appearance before the shock. It was preceded by a subterranean noise, followed almost instantaneously by that of the falling houses. These latter fell so suddenly that even the people living on the street level were unable to reach the threshold in time to save themselves. The tobacco custom-house fell in, and the aga, his officers, and 400 workmen lost their lives in it. Altogether the third of the houses were thrown down, and the remainder more or less injured. Fifteen hundred persons perished.	Olivier, <i>loc. cit.</i> t. vi. p. 358; Cotte.
October. Bienne in Switzerland... ght be- en 21 l 22.	Two severe shocks, lasting nearly a minute. Apparent direction = S. to N.				Moniteur, 25 Brumaire, An. 5.
— 22. In the territory of Modena.	A vibratory shock				Cottia.
— 23. Ripon in England	An earthquake			A cleft opened in the ground, from which water issued.	Gentleman's Magazine, vol. lvi. p. 873.

1796. Oct. Day not given. 2 P.M.	Manilla in the island of Luçon.	A violent earthquake, lasting altogether three minutes four-teen seconds. Several minor shocks were felt on the following days.	In vessels at anchor at Manilla the shock was not felt, but an English ship at sea, eleven leagues from that place, was greatly injured by it, her mainmast being driven up out of the step, by the blow from beneath.	During the shock the air was hot and close, and perfectly calm. Water was thrown out of the gutters and wells; so that a large cistern, which was full before the shock, was found to be diminished in depth to the extent of 3 inches. After the shock the narrator felt stupefied, and suffered pains in his knees.	De Guignes's account of the Philippine Islands, in Pinkerton's Voyages and Travels, vol. xl. p. 84.
—	Copiapó in Chili	An earthquake	Flames and suffocating vapours burst forth from the lake of Quilotoa in the district of Liactunga, and destroyed herds of cattle feeding on its shores.	Accompanied by loud subterranean noise. Similar noises had been heard from time to time in the interior of Tunguragua since 1791. Within the most violently disturbed district all the towns and villages were ruined, the houses being thrown down, and many crushed beneath great masses of detached rock. 40,000 persons perished. The ground about Tunguragua opened into enormous clefts, from which volumes of water and stinking mud issued, forming lakes in many places of considerable size. Tunguragua remained perfectly still during the earthquake, and the smoke of the volcano Pacto, seventy-five leagues distant, disappeared suddenly into the crater.	Basil Hall, Journal written on the coast of Chili, vol. ii. p. 25. Annales de Historia Natural, t. i. Nr. 4. Madrid, 1800; Journal de Physique, t. xlii. p. 250; Gilbert's Annalen, B. 6. S. 67; Humboldt, Voyage (4to), t. i. p. 317; v. Moll's Annalen, B. 2. S. 435. &c. &c.
1797. Feb. 4. 7½ A.M.	In the territory of Quito, S. America. The centre of disturbance seems to have been the volcano Tunguragua; and the most violently shaken district extended forty leagues from S. to N. and twenty from W. to E. The earthquake was perceptible over a space of 170 leagues from S. to N. (from Puera to Popayan) by 140 from W. to E. (from the river Napo to the sea).	A terrible destructive earthquake. The first wave-like vibrations (at 7½ A.M.) lasted nearly four minutes. At 10 A.M. and 4 P.M. more shocks were felt. They recurred at intervals up to the 5th April, on which day at 2½ A.M. they were but little less violent than the first.			
About this time.	The Lesser Antilles	A series of shocks began at this time, which did not cease for eight months, until the eruption of the volcano in Guadaloupe on the 27th September put an end to them.			Ditto.

1.	2.	3.	4.	5.	6.
Feb. 20 Island of Sumatra passed three minutes tenually in the distance, followed by slight of Padang, and on the coast for three in 24 coast to the ex- wards the south.					
Mar. 8. Palermo .....	An earthquake				Hofmann in Poggendorff's Annalen, <i>loc. cit.</i> Hamb. Corresp. Nr. 167.
July. Kingston in Jamaica ...	Some slight vibrations				
Aug. 11 A.M.	Rivesaltes, Collioures. A shock of such severity that the canals in that region (depart. Eastern Pyrenees), were shaken on their carriages.				Palassou, <i>loc. cit.</i> p. 269 and 270.
— 13. P.M.	Perpignan more strongly. At Perpignan a vibratory shock lasting at the village of La Roque, and most of all along the sea-coast from Collioures to Saint-Laurent-de-Salanque had been felt before, at 9 A.M.			Perrey gives these shocks in 1798	Ditto.
Sept. 8.	In the village of Ile d'Albi a heavy vibratory (depart. Eastern Pyrenees).				Ditto.
Oct. 19. A.M.	Temeswar in Hungary. Vibrations during a quarter of an hour. This occurred at 3 and 5 P.M., and at 9 P.M. two shocks were felt.			The two shocks at 9 P.M. were preceded by a heavy rolling noise.	v. Moll's Annalen, B. 2. S. 442; Voigt's Magazin für den Neueste aus d. Phys. u. Naturgesch. B. 1. Nr. 2. S. 143.
Nov. 12. Dec. 11.	Rouen ... The town of Cumana, S. America, and the surrounding country.	A vibratory shock ... A violent earthquake, preceded by a slight wave-like motion. Then came violent perpendicular shocks from beneath up-			Cotte. Humboldt, Voyage, t. ii. p. 275.

1798. Jan. 31.	Parthenay - le - Peuple, France.	wards. A very feeble shock.	in the bay of Cariaco near Maraquitas flamed came up from the earth, followed by a subterranean noise like bubbling, and then by the shocks. The latter were like the springing of a mine at a great depth, and laid four-fifths of the city in ruins.	Moniteur, 27 Pluviôse, An. 6.
— Mar. 14.	Sarregruives, Bistat, and other communes of the department la Meurthe.	A very violent shock.	At Bitche a part of the arch of the bridge was raised. The district in which this shock was felt contains many mines of coal, of which one, like the Solfatara of Naples, is continually burning. Some days before, a meteor was observed three leagues from Metz.	Ditto, Germinal, An. 6.
—	Measina	Repeated vibrations during this period.	Etna was in a state of eruption	v. Hoff.
Until July.	Florence and Sienna	At Florence a severe earthquake. The shocks lasted until daybreak, when the last and most severe occurred. At Sienna the motion was undulatory and as severe as at Florence.	At Florence many buildings were seriously injured. The shocks were preceded there by a loud explosion. It was remarked that they were less violent on the side towards the sea. For some days before the air had been very close and hot, but after the earthquake severe cold set in. On the 21st and 22nd a tremendous storm raged from Fiume in the Adriatic to Hungary.	Hamb. Corresp. Nr. 97, 99, u. 102; Moniteur, 30 Prairial, 1, 2, 3, 6, et 10 Messidor, An. 6.
—	Sienna	Another shock		Moniteur, loc. cit.
Beginning of the following night.				
— 27.	Ditto	Ditto, equally violent.	At the end of the month the city was nothing but a mass of débris. A very deep chasm had formed in the principal square.	Ditto.
Between 3 and 4 A.M.		Others were felt on the 28th. Up to the 6th June twenty-two shocks had been felt, of which two were very violent.		
— June 14.	Leghorn	A slight shock, followed in two hours by a stronger. Supposed direction—N. to S.		Moniteur, 21 Messidor, An. 6.



1.	2.	3.	4.	5.	6.
June 17. Night.	Western part of the island of Teneriffe.	Some vibrations		Accompanied by loud explosive noises, heard over the whole island. Followed by a great eruption of Chahorra or Venge, a volcano close to, or rather on the side of the Peak of Teneriffe. This eruption lasted three months and six days. For details, vid. v. Hoff.	Bory de St. Vincent, Essai sur les îles Fortunées, p. 295; v. Buch, Canar Ins. S. 235, &c.
August.	From Perm in Russia to several places from the Urals, over a space of 500 wersts in length by 150 in breadth.	Several shocks from S.W. to N.E.		Preceded by subterranean noise	Nova Acta Acad. Imp. Petropol. vol. xiv.; Hist. p. 44.
Nov. 7. 1½ A.M.	Bordeaux and the country round it.	Concussions assez violentes à un tremblement de terre.		In the country some new walls fell	Moniteur, 27 Brumaire. An. 7; Hamb. Corresp. Nr. 189.
Dec. 15. Evening of month?	Calabria	Some slight shocks. Another earthquake.	On the 17th December the sea rapidly rose above its usual level and extended 5 kilomètres as far as Aigues-Mortes (France). (Moniteur, 10 et 12 Nivôse, An. 7.) No shock is mentioned, but Ferrey considers it as an instance of a "terre moto di mare."	This notice was written from Frankfurt on the Maine on the 13th December, and merely said that Calabria had again suffered from an earthquake.	Hamb. Corresp. Nr. 195. Ditto, Nr. 203; Beil.
	Between the rivers Guaviare and Rio-Negro in the north of South America.	An earthquake			v. Hoff.
	In Guatemala	A violent and destructive earthquake.	Some time in this year there was remarked a violent and unusual motion of the sea on the English coasts. No shock	In April there was an eruption of the volcano Iscalco in Guatemala. (v. Buch.)	Ennery et Hirth, Dict. de Géogr. t. iv. p. 508.

1799. Jan. Night between 7 and 8.	In Iceland .....	An earthquake .....	spoken of. (Férus- sac, Bull. des Sc. math. &c. t. iii. p. 176.) The sea inundated the country.	Accompanied by a terrible storm .....	Moniteur, 29 Prairial et 1 Messidor, An. 7.
— 17.	Comrie in Perthshire ...	A shock from W. to E. of 2 secs. duration. At Caen (before 4 A.M.) some shocks, appar- ently from N. to S. At Laval (3 <sup>h</sup> 45 <sup>m</sup> ) a pretty smart vibra- tion. At Nantes (about 4) a severe shock, lasting more than a minute. At La Flèche (4 <sup>h</sup> 15 <sup>m</sup> ) a shock of 25 secs. At Bordeaux a shock from W. to E., lasting more than a minute. At Machecoul several other shocks were felt during the day. The most severe being at 9 A.M. At the islands of Bouin and Oléron two shocks from S.W. to N.E.	.....	Accompanied by a subterranean noise .....	Thomson's Annals of Philosophy, vol. viii. p. 367.
— 25.	On the west coast of France; at Rouen, Auxerre, Nantes, in La Vendée, at Ro- chelle, island of Olé- ron, Rochefort, Bor- deaux, Laval, Caen, &c., and in Jersey. Also, according to some, in Paris itself.	.....	.....	At Nantes and the island of Bouin (La Vendée) loud noise was heard. At Machecoul it rained soon after the shocks, and thundered all day. At the island of Bouin many houses were thrown down. The atmosphere appeared fiery- red, and soon after the earthquake a violent wind arose, which lasted two days. v. Hoff records another earthquake in the same region on the 26th January, 1800, but from the par- ticulars given that date is obviously erroneous, and the account refers to the earthquake here given.	Moniteur, 27 Pluviôse, An. 7; Hamb. Corresp. Nr. 33.
— Feb. 5. Noon.	Nantes .....	Another very slight shock.	.....	Accompanied by noise, without undulation, like a prolonged bellowing, or the rolling of a car- riage.	Moniteur, 27 Pluviôse, An. 7; Hamb. Corresp. Nr. 33.
— 6. 2 <sup>d</sup> 10 <sup>m</sup> P.M.	Ditto .....	Another shock, rather more perceptible than the last.	.....	Accompanied by the same noise as before, but a little louder.	Ditto.
— 19. 4 P.M.	Avignon .....	Two violent shocks...	.....	An old bridge and some houses were thrown down.	Moniteur, 13 Ventôse, An. 7; Cotte.

1.	2.	3.	4.	5.	6.
1799. Feb. Night between 21 and 22.	Frankfort on the Maine and Gießen. Also sup- posed to have been felt at Dusseldorf.	Earthquake shocks...		Accompanied by a terrible storm, with light- ning, &c.	Moniteur, 27 Ventôse, An. 7; Hamb. Corresp. Nr. 37 u 46.
— 24.	Comrie in Perthshire	A shock from W. to E., lasting 2 seconds.		Attended with subterranean noise.	Thomson's Annals of Philosophy, vol. viii. p. 367.
— March 5.	Breslau	Vibratory shocks			v. Hoff.
4 <sup>h</sup> 30 <sup>m</sup> A.M. — April 20. 6 P.M.	Nice	Another earthquake			Moniteur, 27 Ventôse, An. 7; Hamb. Corresp. Nr. 50.
— or Ireland	Drontheim in Norway	An earthquake			Hamb. Corresp. Nr. 78.
in May.		Ditto		Very probably at the same time with the Dron- theim earthquake.	Ditto, Nr. 88.
— May 29.	Brescia	A severe earthquake		Houses were thrown down	Ditto, Nr. 100.
— June 17.	Acapulco	A destructive earth- quake.			Ditto, Nr. 181; Moniteur, 11 Bru- maire, An. 8.
— Aug. 18.	Palermo	An earthquake			Hoffmann, <i>loc. cit.</i>
— In the mountains of	Caripe and Carapano, near Cumana, South America.	Eleven severe shocks.		v. Hoff gives the date 28th August	Humboldt, Voyage, t. iv. p. 18, et t. x. p. 333; v. Zach, Monath. Corresp. Th. 1. s. 395.
— 25. Cumana		A slight shock			Humboldt, <i>loc. cit.</i>
— Sept. 5. In Ekaterinodar (Russia)		Two severe shocks. At sunrise on this day a new island rose from the Sea of Azov			Pallas, Reise in d. süd. Statthalterch. des Russ. Reichs, Th. 2. s. 316;
7 P.M.		rapidly succeeding each other. (During the rising of the island in the Sea of Azov also, vibrations were felt this day through- out the Kouban.)			Kefenstein, Moniteur, 29 Floreal, An. 8; Dubois de Montpereux, Voy. autour du Caucase, t. v. p. 32.
— 29. Albano was apparently		Repeated vibrations			Constitutionnel, 14 Juin, 1859;
to the end of	the centre of these	during this period.			Preuss Staatszeitung, 1859, Nr. 170.
the year.	shocks, which ex- tended to Rome, Ma-				

1799. Oct. About the middle of the month.	rino, Larice and Gen- sano. Lisbon	Two slight vibratory shocks.			Hamb. Corresp. Nr. 181.
— Nov. 4. 4 <sup>h</sup> 12 <sup>m</sup> P.M.	Hirschberg in Silesia	A vibratory shock		There had been an eclipse of the sun on the 28th October, and from that day until the 7th No- vember the atmosphere was filled with a dry reddish vapour. A little before the shock, some people who were drawing water from a well of 18 or 20 feet deep, heard a noise like an explosion of gunpowder, coming, as it were, from the bottom. At the same time thunder and lightning were observed, and some minutes before the shocks a heavy gust of wind, fol- lowed by large drops of rain charged with elec- tricity. These phenomena were succeeded by a calm, which lasted all the remainder of the night. The third shock was also accompanied by loud subterranean noise. The barometer was not affected, but Humboldt observed very remarkable changes in the variation of the magnetic needle.	Berliner Spensersche Zeitung, 1837, Nr. 73. Moniteur, 4 Floréal, An. 9; Hum- boldt, Voyage (8vo), t. iv. p. 16; Kefenstein.
— Dec. 11. In the after- noon.	In Silesia; at Schweid- nitz, Glatz, Freders- dorf, Dittersdorf, Fried- land, Lieberwerda, Wit- tichsthal, Haindorf, Raspau, Hirschberg, all the villages of the Riesengebirge, Schmie- deberg, Landeshut, &c., for the most part in a line from Glatz to Mar- klissa.	At Schweidnitz there was an oscillation of the surface con- sisting of three suc- cessive movements, quickly following each other. At all the other places the shocks were felt more or less vio- lently, for the most part in the direc- tion S. to N.	There was a thick fog at the time, which at one place smelled of sulphur. In almost all the places mentioned the shocks were accom- panied by a subterranean rolling noise, which was also heard at many places where no mo- tion was felt. In the coal pits between Glatz and Bohemia the shocks were strongly felt. At one place thunder and lightning, appa- rently coming out of the thick mist, preceded the earthquake, and the barometer oscillated considerably. Cats appeared uneasy before the shock. No similar event had occurred in this part of Silesia for fourteen years.	Voigt's Magazin, Th. 2. s. 263; Gil- bert's Annalen, B. 4. s. 128, u. B. 5. s. 203; Neue Schriften der naturforschenden Freunde zu Ber- lin, B. 3. s. 180, 191 u. 199, &c.	
— At the end of the year.	In the Calabria and at Messina.	Violent earthquakes			Moniteur, 8 Pluviose, An. 8.

1.	2.	3.	4.	5.	6.
1799. Some time during the latter half of the year.	Truxillo ("in Honduras, Venezuela, or Peru?").	A destructive earthquake.		Very probably this alludes to the Cumana earthquake of the 4th November.	Hamb. Corresp. 1800, Nr. 20, Beil.
1800. Jan. 12 & 22. (O.S.?)	In the mines of Koutonsk, near Nertschinsk, in the Oural.	Some shocks from S.W. to N.E.		Preceded each time by an explosion like that of a 6-pounder, the noise lasting about 2 secs.	Bull. des Sc. Nat. t. viii. (Mai 1826) p. 21.
— Feb. 26. 9 P.M.	Lisbon	One shock		Accompanied by heavy rain. Buildings were injured.	Hamb. Corresp. Nr. 52.
— 27. 3 A.M.	Ditto	Ditto		An eruption of Kina began on this day which recurred at intervals until the middle of the year 1802.	Ditto; v. Hoff.
— March 8. 9 A.M.	At Mexico	A violent earthquake. The motion was first for 4 mins. from E. to W., then for some time from N. to S., and finally in a circular direction.		Many buildings were injured, and finally the earth opened in clefts.	Annales de Historia natural (Madrid), t. ii. No. 5. p. 235.
— 17. 10 <sup>h</sup> 18 <sup>m</sup> A.M.	Ditto, and at the same time at Cuernavaca.	Repeated, but slight vibrations.		The air was stormy, and a tempest blew from the south. Two days before, the barometer oscillated to a great extent.	Ditto.
— — —	Philadelphia in the United States.	One shock			v. Hoff.
— — —	On the banks of the Ganges.				Philosophical Transactions.
— April 1. — June 23.	Port-Rieux in Bretagne. Palermo	An earthquake. Ditto		A letter from London of the 17th July says that a chasm had opened in Bredon Hill, Worcester-shire, and was daily enlarging. It was supposed to have been caused by a <i>late</i> earthquake there, but when this occurred is not said. Possibly that of the 18th November, 1795, is alluded to. (Allgemeine Zeitung, 1800, no. 212. s. 894.) In the neighbourhood of Nice the fall of a mountain is also recorded about the end of July, no earthquake, however, being mentioned. (Allgemeine Zeitung, no. 231. s. 970.)	Hamb. Corresp. Nr. 64. Hoffmann, <i>loc. cit.</i>

1800. Sept. 24. Night of 23—24. 0 <sup>h</sup> 50 <sup>m</sup> A.M.	Genoa .....	A violent shock, lasting some seconds.	.....	.....	Moniteur, 21 Vendémiaire, An. 9; Hamb. Corresp. Nr. 166, Beil.
— 26. Oct. 17. 5 <sup>h</sup> A.M.	Constantinople .....	Several shocks .....	.....	.....	Mém. de Chronol. <i>loc. cit.</i>
— 26. Oct. 17. 5 <sup>h</sup> A.M.	At Eau-Chaudes and some other places in the valley of Ossau, in the Pyrenees.	Two shocks in the space of 5 minutes.	.....	A great mass of rock was detached, and rolled some distance.	Palasson, <i>loc. cit.</i> p. 270.
— 18. Nov. 3. 11 A.M.	Ditto .....	Another shock .....	.....	.....	Ditto.
— 18. Nov. 3. 11 A.M.	Zurich .....	A slight shock .....	.....	.....	Moniteur, 26 Brumaire, An. 9.
— 9.	Brussels. Also, perhaps, in Brandenburg.	Two shocks at Brussels.	.....	.....	Hamb. Corresp. Nrs. 183, 184, 185, 186 u. 189; Moniteur, 25 Brumaire, An. 9.
— 29.	Philadelphia in the United States.	A severe shock .....	.....	.....	Hamb. Corresp. 1801, Nr. 15.
— Dec. 25.	Newport, Hanover, Boston, Concord, and other places in the United States.	Ditto .....	.....	.....	Moniteur, 24 Ventôse, An. 9.
—	Inverness in Scotland...	An earthquake .....	.....	.....	Thomson's Annals of Philosophy, vol. viii. p. 367.
— & 1801.	Châteauroux (depart. Indre) in France.	Several shocks felt at this place in the course of the 2 years.	.....	.....	France pittoresque, t. ii. p. 92.
1801. June. 1st or 2nd Monday in the month.	Chester and the neighbourhood (England).	Rather a smart shock.	.....	.....	Moniteur, 24 Prairial, An. 9.
— July.	Eskilstuna in Södermanland, Sweden.	A violent earthquake.	.....	.....	Ditto, 27 Vendémiaire, An. 10 (quoting "la rubrique de Stockholm, 8 Août").
— Sept. 7. 6 A.M.	Edinburgh, Glasgow, Perth, Callander, Crieff, Stirling, and over almost the whole of Scotland. The centre appeared to be at Comrie in Perthshire.	Several vibratory shocks from N. to S. at Edinburgh.	.....	Houses were thrown down, mountains overthrown, and great damage done. Unaccompanied by noise .....	Tilloch's Phil. Mag. vol. x. p. 368; Thomson's Annals of Phil. vol. viii. p. 367; Moniteur, 8 Vendémiaire, An. 10.

1.	2.	3.	4.	5.	6.
1801. Sept. Night between 10 and 11.	Colmar and Neu-Breisach.	A severe vibratory shock from N. to S. at Neu-Breisach.			Hamb. Corresp. Nr. 151, Beil; Moniteur, 3 <sup>me</sup> jour. complémentaire, An. 9; Cotte.
Oct. Night between 3 and 4. At midnight. 3 A.M. & 4 A.M.	Semlin on the Danube. Not felt in the environs.	Three shocks at the hours given. The 1st was more violent than the 2nd, and the 3rd more so than either of the former. One of them lasted four minutes.		Followed by heavy wind and rain, which lasted several days.	Moniteur, 10 et 13 Brumaire, An. 10.
8:52 <sup>m</sup> 53 <sup>s</sup> A.M.	At Bologna. Also, about same time, at Cesena; and in a part of the Romagna.	At Bologna, 3 shocks from N.E. to S.W., the undulation of the 1st (which took place at the time mentioned) diminishing by degrees until the 2nd and 3rd were felt. The three lasted only half a minute.		The atmosphere was calm, the sky overcast, and the thermometer at 13° 75 R. One of the clocks of the observatory was stopped, thereby giving the time of the occurrence. Some bells sounded of themselves, and a few chimnies were thrown down.	Ditto, 5 et 6 Brumaire, An. 10. (from an account by Sig. Ciccolini, director of the observatory); v. Moll's Annalen, B. 2. s. 451.
End of the month.	Frascati, Monte-Pozzo, Albano, Riccia, Velletri, and the surrounding district.	One shock			Moniteur, 6 Primaire, An. 10.
Nov. Night between 12 and 13.	Philadelphia, United States.	A vibratory shock			Hamb. Corresp. 1802, Nr. 25.
14.	Palermo in Sicily	One shock			Hoffmann in Poggendorff's Annalen, B. 24. s. 54.
(Begin- ning of De- cember?)	Laybach in Carniola. Also at Eger.	A violent earthquake.		At Eger part of the fortifications fell	Moniteur, 18 Nivôse, An. 10 (quoting "la rubrique de Vienne, 22 Dec.").
	Maracaibo, Caraccas and Porto-Caballo in South America.	Several shocks			Humboldt, Voyage, t. v. p. 13; De Pons, Voyage à la Terre-Ferme, t. i. p. 125.
1802. Jan. 1. 6:45 <sup>m</sup> or 7:15 <sup>m</sup> A.M.	Strasbourg	From N. to S.		Great and wide-spread inundations for a month before.	Moniteur, 20 Nivôse, An. 10; Hamb. Corresp. 1802, Nr. 9, Biel.

1802, Jan. 4. Between 7 and 8 A.M.	Laybach, Trieste, Fiume and Bukkari in Carinthia. Also in the Banat, and in Turkey.	At Laybach, slight. At Trieste, very violent. Several violent shocks from N. to S. at Fiume and Bukkari, each lasting more than a min.	At Fiume and Bukkari the sea rose in masses upon the shore.	In Carinthia some little hills disappeared, and new elevations were formed. Preceded, the same night, at Trieste by a terrible storm of thunder, rain, hail and snow, and a frightful inundation of the sea.	Moniteur, 7, 10, 16, 25 Pluviôse, et 3 Ventôse, An. 10.
— — — About same time with the last.	Séisme de Groëbberg (in Austria?).			Caused the fall of several masses of rock and the sinking of the earth in some places. Followed by terrible rain; accompanied by thunder and lightning. Probably the same shock with that last recorded.	Ditto, 12 Pluviôse, An. 10 (sous la rubrique de Vienne, 17 Janv.).
— — — 9 <sup>h</sup> 15 <sup>m</sup> A.M.	Caumont in the depart. Calvados, Normandy. Torre-la-Mata and Torrevieja in Spain.	An earthquake, lasting 4 or 5 secs. Shocks which continued up to the 6th February.		Some houses were destroyed.	Hamb. Corresp. 1802, Nr. 21.
— — — In the evening.	Strasbourg	Vibratory			Ann. de Chim. et de Phys. t. xlv. p. 395.
— Feb. 2.	Palmouth in Antigua	A severe shock			Hamb. Corresp. 1802, Nr. 21, Biel.
— — — Mar. 19.	Guadaloupe	Vibratory shocks			Moniteur, 24 Germinal et 25 Floréal, An. 10.
— — — April 5.	Antigua, St. Christopher's, and other West Indian islands.	Shocks felt several times during Feb. and Mar., but most violent on this day.	Accompanied by great agitation of the sea.	Accompanied by the eruption of a volcano	v. Hoff.
— — — May 9.	Orvieto in the States of the Church.	Three shocks in an hour.			Hamb. Corresp. No. 79; Moniteur, loc. cit.
— — — 10 <sup>h</sup> 40 <sup>m</sup> A.M.	Lodi, Crema, and the country around.	Lasted 3 seconds.		Very probably the same event with the following, the date being incorrectly reported.	Hamb. Corresp. Nr. 73.
— — — 10 <sup>h</sup> 10 <sup>m</sup> A.M.	In Northern Italy, especially at Crema, Sonzino, Tegengo, Orzinovi and Brescia.	At Mantua the shock was severe; as also at Milan, where it was undulatory from S. to N., lasting about 2 mins. At Parma, three shocks, undulatory, from W. to E., and as far south as the Romagna.		Most violent from west to east along the southern slope of the Alps. At Crema, Sonzino, Tegengo and Orzinovi the most damage of buildings, &c., occurred. At Brescia 11 houses and 3 churches fell. At Parma the direction was given by the swinging of a suspended lamp, which deviated 8 inches from the vertical. At this place the sky was quite clear and free from clouds, the barometer perfectly steady at 28 in., and the thermometer standing at 18°-25. At Genoa the motion was accompanied by a noise like the roll-	Tilloch's Magazine, vol. xiii. p. 95.
— — — 10 <sup>h</sup> 30 <sup>m</sup> at Milan;					Cotte; Hamb. Corresp. Nrs. 87, 89, 93 u. 96; Moniteur, 6, 9, 10, 15
— — — 10 <sup>h</sup> 35 <sup>m</sup> at Parma;					Prairial; Journ. des Débats, 4, 5, 9, 10, 15, 17 Prairial, et 18 Messidor, An. 10.
— — — 11 <sup>h</sup> in Switzerland.					



2.	3.	4.	5.	6.
	At Cremona the motion was violent, but at Venice it was not felt. It was but slight at Turin, in Piedmont, and as far as Roveredo. Near Bardis and at Crema the shocks frequently recurred for three weeks.		ing of carriages or a distant cannonade. Near Bardis openings appeared in the earth, from which much petroleum was procured. The castle of Marguin, situated on the shore of a small lake, sank down and was covered by the water. At Berne furniture was shaken in the rooms, particularly in those of the third storey. An old man and a young woman were thrown down, and the bell of the Maison de Ville sounded.	
ay 15. In the territory of Darmstadt. by 7-Strasbourg or 11. 'A.M.	A violent shock of 15 to 20 secs. duration. A violent shock			Journal des Débats, 17 Prairial, An. 10. Ditto, 25 Messidor; Moniteur, 28 Messidor, An. 10; Cotte.
ig. 7. Caylus in the depart. Lot, France.	Ditto, lasting about 2 minutes.		The same day a loud explosive noise was heard at Cahors and for 40 leagues round it ("précédé d'une flamme dirigée de l'ouest à l'est, par un vent du sud, pendant 4 ou 5 minutes"). The ground moved like the waves of the sea. In one place a piece of ground of 100 feet long and 40 wide sank down, and a pool of water appeared in its stead. In another place the ground was raised. A boat on the Orinoco received such a shock that the rudder was broken.	Journ. des Débats, 30 Messidor et 2 Fructidor; Moniteur, 30 Messidor, An. 10; Cotte.
— 15. Cumana, on the north coast of S. America. before noon, P.M.	Three shocks at the hours mentioned, the last of which was less violent than the other two, and the second the most severe of the three.	The waters of the Orinoco rose so high as to leave a large part of the bed of the river dry.		v. Humboldt, Voyage, t. v. p. 5; Moniteur et Journ. des Débats, 3 Nivôse, An. 11; Allgemeine Zeitung, Nr. 354, s. 1432; Hamb. Correspond. Nr. 197; v. Moll's Annalen.
— 17. Ogenne, in the canton of Navarreux, Lauveterre, and other adjoining places on the northern slope of the Pyrenees. And at La Rochelle.	A slight vibratory shock.		At La Rochelle accompanied by subterranean noise. In all probability the same shock with that at Ogenne, &c.	Palassou, Mém. &c. p. 270; Journ. des Débats, 10 Fructidor, et Moniteur, 12 Fruct. An. 10.
(?) — 18. Berne in Switzerland ... ad 19.	Ditto.			Hamb. Correspond. Nr. 143; Moniteur, 12 Fructidor, An. 10.
— 23. Richmond in Virginia...	Several ditto A terrible shock		Attended with noise like the rolling of a carriage on pavement.	Moniteur, 26 Vendémiaire, An. 11.

1802. Aug. 29. St. John in Antigua ... — In Aug.? Amboyaa and other East Indian islands.	One shock A very violent earth- quake.	The sea rose high upon the coasts, and did very great mischief.	No date is given, but the account is taken from Hamb. Corresp. 1803, Nr. 4. letters of the 25th August.	Hamb. Corresp. Nr. 179.
— Sept. 1. Naples .....	At Naples a slight vibration. In the neighbourhood of Capua the shock was more violent.		For two days before smoke had issued from Vesuvius. At Naples there had been no rain, except on a single day, since March; the sky had been constantly clear, and the heat very great, especially on the 8th and 21st August, when it was almost unbearable.	Moniteur, 26 vendémiaire, an 11; Hamb. Corresp. Nr. 162; Cotte.
— 11. Strasburg .....	A rather violent shock from S.W. to N.E.			Journ. des Débats, 30 fructidor, 2 et 3 complémentaire, an 10, 1 et 2 vendémiaire, an 11; Moniteur, 2 compl. an 10 et 3 vendém. an 11; Hamb. Corresp. Nr. 155.
A few minutes after 7 <sup>h</sup> 30 <sup>m</sup> A.M.				
— 12. Ditto .....	Another shock, follow- ed, an hour after- wards, by one of greater severity.		Accompanied by a violent wind from the south. The shock felt in the houses like the fall of a great weight.	Ditto.
6 <sup>h</sup> 36 <sup>m</sup> A.M.				
— 13. Ditto .....	Four more shocks, the first of which lasted more than a minute.			Ditto.
— 15. Ditto .....	Rather slight			Ditto.
2 A.M.				Ditto.
7 <sup>h</sup> 4 <sup>m</sup> A.M.	Violent motion		Attended with subterranean noise	Ditto.
A little before midnight.	More shocks, all from N. to S.			Ditto.
— 25. Kingston in Jamaica ...	A slight shock.			Moniteur, 9 frimaire, an 11; Hamb. Corresp. Nr. 194.
— Oct. 1. Beauvais in France .....	Ditto		At the same time a globe of fire was observed, which moved from E. to W., and disappeared with a loud explosion, leaving behind a strong smell of sulphur, which remained a long time.	Journ. des Débats, 15 vendém. an 11.
Between 9 and 10 P.M.				
— 23. Strasburg .....	Another shock			Ditto, 7 et 13 brum.; Moniteur, 11 brum. et 3 frim. an 11; Hamb. Corresp. Nr. 175, Bell.
7 <sup>h</sup> 30 <sup>m</sup> A.M.				Ditto.
— 24. Ditto .....	Another, rather vio- lent.			



1802. Nov. 8. Ditto	Ditto	Ditto	Ditto	Ditto	Ditto
In the morning.					
11 <sup>h</sup> 30 <sup>m</sup> P.M.	Strasbourg. Said to have been, like all the former shocks, quite local. It was, however, felt at Weissenburg.	Another shock, the most violent of all those felt this year.		Produced cracks in some vaults	Journ. des Débats, 23, 24 brum. et 1 frim. an 11; Monteur, 24 brum. et 3 frim.; Hamb. Corresp. Nr. 185.
22	Colre and several other places in the Grisons.	A rather severe shock.			Journ. des Débats, 4 nivôse, an 11; Hamb. Corresp. Nr. 205, Bel.
26	Constantinople, Galata, and Pera.	Violent vibrations for nearly two minutes.	The sea remained calm	The day was hot, and the wind from the north. Many houses were injured. Very probably only the event of October, incorrectly reported as to date.	v. Moll's Annalen, Bd. II. S. 459.
27	Antua in the department of Saône et Loire. Also at Arnay in the depart. Côte-d'Or.	Several shocks.		Preceded by a dull noise moving from E. to W.	Journ. des Débats, 10 et 19 frim.; Hamb. Corresp. Nr. 197.
1 (or 2) A.M.					
Dec. 12	In the district of Mont-Blanc.	Vibratory shocks.			Kaferstein, Verzeichniss der Erdbeben, u.s.w. in Zeitung für Geognose, Geologie, u.s.w. Weimar Jahrgang, 1827, St. III. S. 326.
18	In Swabia. Also in the Netherlands, especially at Rotterdam.	Ditto			Ditto.
19	Sion in the Haut-Valais. Frequent shocks. Not felt in the Bas-Valais, even at St. Pierre but two leagues from Sion.	alight shocks. Recurred on the 25th and 26th.		Some of the shocks of October and November had also been felt in this district.	v. Moll's Annalen, loc. cit. S. 460.
23					
20	Elbeuf in the depart. Seine-Inférieure. Mayence	A shock of eight seconds' duration. A slight earthquake.		A violent storm occurred on the same day	Journ. des Débats, 6 nivôse; Hamb. Corresp. 1803, Nr. 3.
Night between 23 and 24.					Hamb. Corresp. Nr. 2.
31	Sisteron in the department Basses-Alpes.	A rather severe shock, which recurred at 2 P.M.		The air was calm, the sky overcast, and the wind south. The barometer had been much agitated during the morning. The sun rose of a glowing red colour.	Journ. des Débats, 19 nivôse; Hamb. Corresp. Nr. 11.
9					

	2.	3.	4.	5.	6.
.....	Unalashka, one of the Aleutian islands.	Very violent shocks during the year.	.....	.....	Langsdorff's Bemerkungen auf einer Reise um die Welt. Bd. ii. p. 209; Gilbert's Annalen der Physik, Bd. xlii. S. 217 u. 414.
Jan. 8. 10 A.M.	Bialystock in Poland ...	A violent shock, followed, at 4 and 5 A.M., by others, all apparently coming from the west. In the following night, at 11½ P.M., another shock was felt, and some inhabitants believed that there were still more afterwards.	.....	The winter had been very mild, and in December but little snow had fallen. On the 2nd January, however, the temperature suddenly fell to -21 R., and yet two days afterwards a thaw set in. On the 6th the cold suddenly returned, and at the time of the first shock the thermometer stood at -25 R. By this shock buildings were shaken from their foundations. The next morning, in the city, a long and perfectly straight crack was observed in the frozen ground. Several other cracks were remarked on the morning after, and one in the wall of a strong public building. The cold became very great, and continued so for four days. During the whole period described there was very little wind, but on the evening of the last shock a pretty strong north wind blew, which, v. Hoff observes, extended widely over Europe, and appeared as a violent tempest at Trieste on the 11th.	v. Moll's Annalen, Bd. ii. p. 460; Journ. des Débats, 19 et 21 pluviôse; Moniteur, 23 pluviôse, an 11.
— week of month.	Sion in the Valais .....	Several shocks, more violent than those felt here in the preceding month.	.....	.....	Hamb. Corresp. Nr. 32, Beil; v. Moll's Annalen, loc. cit.
Feb. 2. en 11 nd mid-	Marseilles .....	A rather violent shock	.....	Some chimnies were thrown down. v. Hoff, quoting the Hamb. Corresp. and v. Moll, gives the date Feb. 3.	Journ. des Débats, 24 pluvi. an 11; Hamb. Corresp. Nr. 32; v. Moll's Annalen, loc. cit. p. 461.
lar. 12. y 10 P.M. 10 past ight.	Guadeloupe..... Pointe-à-Pitre. Santa- Anna, and Maria Ga- lante.	A severe earthquake Thirteen shocks in the time mentioned, the first at 9h 15m.	.....	.....	Hamb. Corresp. Nr. 108. Eyriès, Histoire des Voyages, quoted by M. Perrey in his memoir on the earthquakes of the Antilles.
pril 25.	At Niort, and in the de- part. Deux-Sèvres.	A slight vibration ...	.....	.....	Journ. des Débats, 15 prair. an 11.

1803. July. At Ancona .....	Shocks which were not sufficiently violent to cause any damage.	.....	.....	Ditto, 14 therm.
— 24. Christiana in Norway. 11 P.M. At Laurwig 11 <sup>h</sup> 5 <sup>m</sup> .	A violent shock from E. to W.; at Laurwig it was slight, and from N. to S.	.....	At Christiana the shock was preceded by a noise like thunder. At Laurwig it was <i>followed</i> by an aerial disturbance and noise. The electrometer did not indicate any considerable amount of electricity in the air.	Moniteur, 9 fructidor, an 11; Kai-lan; Cotte.
— ...	On the banks of the Ganges, especially in the upper part, from the Jumna to the mountains from which it springs.	.....	The town of Barahat (Berahhat or Badrinath), amongst others, suffered greatly from this event. Several villages were swallowed up.	Asiatic Researches, vol. xi.; Neue Allg. Geogr. Ephem. B. viii. S. 157.
— Aug. 15. Constantinople .....	Vibratory .....	.....	On this same night there rose an island in the Claveezer See near Plön in Holstein. It was about a thousand yards from the nearest point of land, in three fathoms water, and had a circumference of about eighty feet, rising three or four feet above the surface of the water. The island consisted of the sand of the former bottom with fragments of turf. No earthquake is mentioned at the place. The island was gradually washed away and disappeared. (Gilbert's Annalen, B. xvi. S. 384; Voigt's Magazin, B. vi. S. 260. u. B. vii. S. 364, &c.)	Moniteur, 16 vendém.; Journ. des Débats, 17 vendém. an 12.
— 16. Riom in Auvergne .....	Several shocks.	.....	.....	Cotte.
— 19. Constantinople .....	More shocks, apparently from N. to S.	.....	.....	Moniteur and Journ. des Débats, <i>loc. cit.</i>
— 25. In Spain and at several points on the coast of the Mediterranean.	.....	.....	.....	Mém. de Chronol. t. ii. p. 932.
Oct. 8. Gordes in the depart. of Vaucluse, France.	Some persons <i>believed</i> they felt an earthquake.	.....	An <i>acrolite</i> fell at Apt on the same day between 10 and 11 A.M.	Moniteur, 2 frim. an 12.
Between 6 and 7 P.M. 13. Palermo .....	Several shocks .....	.....	.....	Poggendorff's Annalen, Bd. xiv. S. 54.
and 14. 17. Tiflis .....	An earthquake .....	.....	Walls were cracked by the shock .....	Dubois de Montpéroux, Voy. autour du Caucase, t. iii. p. 271.

(O.S.)

	2.	3.	4.	5.	6.
Oct. 17. S. Philippe and Benignin in the kingdom of Valencia, Spain.	A rather violent vibration.			No damage ensued.	Moniteur, 19 frim. an 12.
Nov. 9 Palermo and Messina ... 0.	Severe shocks, in the direction from E. to W.			Etna remained undisturbed.	Poggendorff's Annalen, loc. cit.; Hamb. Corresp. 1803, Nr. 202; Journ. des Débats, 27 frim.; Moniteur, 28 frim. an 12.
Dec. 12. Chamouni ... 5 P.M.	Violent, and in the direction S. to N.			Mont Blanc was violently shaken, and a mass of ice of 100 feet in height fell from it. Soon after the mountains of Breven suffered the same concussions, and great masses of rock were detached and rolled into the valleys below.	v. Moll's Neue Jahrbucher d. Berg- u. Hüttenkunde, Bd. ii. S. 309.
— 13. Along the Lower Meuse, especially in Vlaardingen, Maastrand, Rotterdam, and Schiedam.	An earthquake consisting of slight oscillations.	Also perceived on board ship by the unusual disturbance of the water.			Ditto; Hamb. Corresp. 1804, Nr. 13.
— 28. Nantes, and Antwerp ... 1 P.M.	Some people at each of these places believed that they had felt a shock.			During a tremendous storm which raged also at Paris and Rouen. An igneous meteor was observed.	Journ. des Débats, 10 et 12 nivôse; Moniteur, 11 et 13 nivôse, an 12; Hamb. Corresp. loc. cit.
— In the district of Kemanon at the foot of the Himalayas, and in the neighbouring provinces.	Very violent.			Many buildings were ruined. Possibly the same with the event of July. In this year also there was a violent eruption of Wororai in Hawaii, Sandwich Isles.	Berliner Spanische Zeitung, 1837, No. 59; Edinburgh Journal of Science, vol. vi. p. 371.
an. 13. Madrid and Aranjuez. 5 P.M.	At Malaga a violent vibration from N. to S., lasting 55 secs.; more violent at Aranjuez than at Madrid.				Hamb. Corresp. Nrs. 22 u. 25; Journ. des Débats, 15 et 29 pluviôse; Moniteur, 30 pluviôse, an 12.
— Rotterdam and the neighbourhood; and at the Hague and Bois-le-Duc.	A shock which was violent at the Hague and Bois-le-Duc.	Felt also at sea.			Journ. des Débats, 1 pluviôse; Moniteur, 3 et 5 pluviôse, an 12.
— Malaga. Also very destructive at Velez, five miles from Malaga.	Several shocks. That at 5 A.M. was very violent, in the direc-			Accompanied at 5 A.M. (4 <sup>h</sup> 55 <sup>m</sup> according to v. Hoff) by noise. The atmosphere was obscured and hot.	Journ. des Débats, 13 ventôse; Moniteur, 14 ventôse, an 12; Hamb. Corresp. Nr. 33.

night, 3 and 5 A.M.	and in Murcia.	tion N. to E. (sic) and the motion lasted nearly a mi- nute.		In one of the churches the chandeliers swung more than two feet from the perpendicular.	Gentleman's Magazine, vol. lxxiv. p. 267.
1804. Jan. End of the month.	Rotterdam, Haarlem, &c.	W. to E.			
— Feb. 3. 1 A.M.	Departm. Mont Blanc.	Shocks.			Voigt's Magazin, Bd. viii. p. 72.
— 6. 1 A.M.	Motril in the kingdom of Grenada.	The shocks continued from the time of those at Malaga up to this date, one or two being felt each day. That of the 6th here given was the most violent. Its direction was supposed to be W. to E. The shocks recurred at intervals of (within a few mi- nutes) three hours, and always lasted four minutes.	These shocks extend- ed to sea.		Moniteur, 23 ventôse; Journ. des Débats, 24 ventôse.
— 9.	Palermo; and, the same day, near Mt. Etna.	At Palermo one shock. At Etna a percepti- ble vibration.			Ann. de Chim. et de Phys. t. xxi. p. 409; Poggendorff's Annalen, loc. cit. v. Hoff.
— 15. St. Petersburg.	Vibratory				Moniteur, 23 ventôse; v. Hoff.
— 16. Motril in Grenada. Also a little after 6 A.M.	A rather severe shock, lasting 2 or 3 secs. At both Motril and Malaga numerous shocks during the day.				
—	In Styria	Shocks.		On the 24th of this month a great storm of thun- der and lightning raged over nearly all Ger- many, the whole of the Netherlands, and even as far as Moscow, accompanied by snow, and did much damage to buildings in various places.	v. Hoff; Hamb. Correspond. Nr. 37 u. 65.



1.	2.	3.	4.	5.	6.
Feb. St. Servan in France	Shocks				v. Hoff.
Mar. 1. Malaga, and Motril in Grenada.	Repeated shocks				Ditto.
— 2. Moustier in the departm. Mont Blanc.	Several shocks				Journ. des Débats, 28 ventôse.
— 4. La Flotte in the departm. Charente-Inférieure.	A slight shock from S.E. to N.W.			Accompanied by a rather loud subterranean noise. The Journ. des Débats adds that shocks had been felt in the Alps, and in different parts of Europe and Africa. Perhaps some of the shocks reported at Malaga extended to the opposite continent. The Hamb. Corresp. gives the date of the event at La Flotte March 5-6.	Ditto; Hamb. Corresp. Nr. 50.
May 5. Malta	One shock				Hamb. Corresp. Nr. 157.
— 11. Florence	Ditto				Journ. des Débats, 23 prairial; v. Hoff.
— 13. Ditto	Ditto				Ditto.
— 17. Ditto	Ditto				Ditto.
— 18. Virginia and New York	Vibratory shocks.				v. Hoff.
— 26. Malta	Another shock				Hamb. Corresp. Nr. 157.
June 8. Sta Maura, Zante, in the Two very severe shocks, followed by a third at 3 A.M.			The ships in the harbour of Patras were violently agitated.		Journ. des Débats, 10 thermidor; Moniteur, 11 thermidor; Hamb. Corresp. Nr. 121.
after Morea, at Patras. Most light of violent at Patras.					
th.					
— 13. Klagenfurth in Carinthia	Three shocks at the hours mentioned, the last being the most violent.			There had been a terrible storm two days before. The barometer was not disturbed.	Journ. des Débats, 21 messidor; Moniteur, 22 messidor.
7 <sup>h</sup> 5 <sup>m</sup> ; 5 <sup>m</sup>					
— 14. Baudissin (Budissen in Silesia?) and several other points in Prussia.	Several shocks			There suddenly appeared on several of the mountains springs which had never been seen before. From the 15th to the 20th June the	Moniteur, 22 et 23 messidor.

1804. July 28.	Spoleto and as far as Nocera.	Violent shocks, especially the first ones. They recurred frequently up to the 26th August, and on the 25th September, the day of the eruption of Vesuvius, the earth in the vicinity of the crater trembled violently.	Elbe and neighbouring rivers inundated their banks, and it was supposed that an earthquake was felt at Dresden. The air was full of thick fog, so that the moon appeared of a blood-red colour. Vesuvius sent forth smoke at the moment of the first shocks. Spoleto itself suffered less damage than many of the villages in the neighbourhood. The Hamb. Corresp. gives the date August 1. On the night of the 4th July a little hill on the peninsula of Taman in the Sea of Azof rose gradually to the extent of 12 fathoms, and finally an eruption took place, and masses of earth and stones, in a state of ignition, were thrown to a great distance. Thus date and those of the shocks in the following months are probably all recorded according to the <i>old style</i> .	Journ. des Débats, 14, 20, 23 fruct.; Moniteur, 15, 21, 28 fruct. an 12. et 3 brum. an 13; v. Hoff; Hamb. Corresp. Nrs. 137, 147, 181, Beil.
— Aug. 7. (O.S.?)	Tiflis in Georgia	A slight shock	.....	Dubois de Montpéroux, Voyage autour du Caucase, t. iii. pp. 271-274.
— Night between 11 and 12.	Ditto	Ditto	.....	Ditto.
— 16.	In Auvergne	Vibratory shocks	.....	v. Hoff.
— 20.	Malaga and Madrid	Ditto	.....	Cotte.
— 22 to 25.	In the kingdom of Granada, especially at Albugnol.	.....	.....	Moniteur, 24 fruct. an 12, 14 et 29 vendém. et 4 brum. an 13; Journ. des Débats, 11, 13, 21, 28 vendém. an 13.
— 25. Beginning at 8 <sup>h</sup> 30 <sup>m</sup> A.M.	Almeria in Grenada, and the surrounding district. Also at Madrid, Malaga, and Carthage. "The region shaken was parallel to the line of the Sierra Nevada, and consequently to the axis of the Mediterranean basin."—v. Hoff.	Within three-quarters of an hour, three terrible shocks and many slighter ones were felt at Almeria. At Albugnol five very violent shocks. The direction was S. to N.	Commenced with a low subterranean noise. Houses fell or were much injured. Rochetta was for the most part ruined. Castel del Popolo, Bella Villa della Palma, and Eniz were also destroyed. In Dalias men were buried beneath the ruins, and in Feliz a bell fell from the church tower. At Albugnol the heavens were obscured by a dark mist, which resolved itself into a cloud, whence, in ten minutes, five terrible flashes of fire (lightning?) issued, and after each flash a shock took place. A strong wind dispersed the clouds, and intense heat set in, which lasted until the 28th, as did also the shock. A mountain in the neighbourhood	Ditto; Hamb. Corresp. Nrs. 144, 157, 169; v. Moll's Annalen, Bd. v. S. 326.

1.	2.	3.	4.	5.	6.
Aug. 25. In the Netherlands; at Schiedam at the hours M. and noon.				was cleft, and from the opening a stream of water poured out upon the lower parts of the town. Springs disappeared in some places, and new ones burst forth in others. Rivers were dammed up and changed their course.	Ditto.
— — — Clermont Ferrand in Auvergne.					Tilloch's Philosophical Magazine, vol. xx. p. 184.
— 30. St. Ann's Bay, Jamaica. 5 <sup>th</sup> P.M.		A single violent shock from N. to S., lasting four seconds.		Preceded by a perfect calm; the air close and almost irrespirable. Thermometer at 85°. Birds and other animals showed decided signs of fear.	Ditto, vol. xx. p. 281.
Sept. 16. In Grenada, especially at the city of Grenada.		Several severe shocks.		Grenada suffered considerable injury	v. Moll's Annalen, Bd. v. S. 328.
— 21. Jassy in Moldavia		Several shocks.			Hamb. Correspond. Nr. 179, Beil.
— 23. St. Malo (Ille et Vilaine), and at the rock of Cancale, at Grandville, Dinan, Saint-Servan, and other places on the coast.		At St. Malo a severe shock, followed at 5 <sup>h</sup> 13 <sup>m</sup> by a second of less violence. The motion was from N.E. to S.W., and lasted 10 to 12 seconds. At the other places mentioned it was from E. to W., and lasted about 43 secs.	This same day a terrible tempest extended over the German Ocean.	Accompanied at St. Malo by a noise like the rumbling of carriages on a wooden bridge. Some people were made sick by the motion, and dogs bayed. At the end of this month Vesuvius threw forth some lava again.	Journ. des Débats, 8 et 9 vendém.; Moniteur, 9 et 10 vendém. et 5 brum. an 13; Hamb. Correspond. Nrs. 162, 166; Cotte; v. Moll's Annalen, Bd. v. S. 328.
— Tiflis in Georgia		A slight shock.			Dubois de Montpéroux, loc. cit.
— Ditto		A severe one		The day had been rather cloudy but agreeable. The following night first white frost was observed.	Ditto.
— In the kingdom of Grenada.		The shocks recurred on this day.			v. Moll's Annalen, Bd. v. S. 328.
— 24. Tiflis		An earthquake less violent than the last.		The day had been very fine	Dubois de Montpéroux, loc. cit.

1804. Sept. 26. Tiflis 2 A.M.	Another shock, a little more severe.			Several walls fell. The day had been stormy, and the night rainy.	Dubois de Montpéreur, <i>loc. cit.</i>
29. Ditto 11 A.M.	A feeble vibration, which is yet afterwards said to have been infinitely more severe than that of the 23rd. During the night there were four alight shocks, in the intervals of which a slight motion of the earth was perceived.			The Moniteur (19 nivôse, an 13.) only mentions shocks on the days following:—24th at 8 <sup>h</sup> 35 <sup>m</sup> P.M.; 25th at 9 <sup>h</sup> 10 <sup>m</sup> P.M.; 26th at 1 <sup>h</sup> 25 <sup>m</sup> , and 29th at 8 <sup>h</sup> 40 <sup>m</sup> and 10 <sup>h</sup> P.M. None of these probably are separate events from those recorded in this catalogue, and seem less likely to be accurate as to date.	Ditto.
30. Ditto 4 and 8 A.M. and 2 and 10 P.M.	Four slight shocks at the hours mentioned.				Ditto.
Oct. 1. Ditto After mid-night, and	Another shock				Ditto.
Between 6 and 9 P.M.	Three shocks				Ditto.
3 A.M.	A slight shock.			The days were now very cold and rainy	Ditto.
5. In the evening.	In Tuscany, in the valley of Elsa, particularly at Colle, Poggibonsi, and S. Gemignano.				Pilla, <i>Istoria del tremoto, &amp;c.</i>
6. Tiflis	Another shock.				Dubois de Montpéreur, <i>loc. cit.</i>
10 P.M.	Another, very severe.				Ditto.
After mid-night.	A slight vibration				Ditto.
Night between 10 and 11.	Very violent			The inhabitants of several villages were obliged to sleep in the open fields.	Moniteur, 20 brum. an 13; Moll's Annalen, Bd. v. S. 328.
14. Sienna and the neighbourhood.					

	2.	3.	4.	5.	6.
Oct. 16. Tiflis a. and		Renewed shocks .....			Dubois de Montpéroux, <i>loc. cit.</i>
— 17. Ditto		Another shock .....			Ditto.
— 18. In Tuscany, in the valley of Elsa, and the places mentioned together above.		The most severe of all the shocks felt this month.		The 15th was a very warm day; in the evening there was a violent storm with sudden gusts of wind. This continued on the 16th and 17th. The 18th was rainy and cold. From the even- ing of the 20th up to midnight of the 21st the rain was very heavy, after which there came a terrible tempest lasting till noon next day. Accompanied and followed by <i>rambi</i> or dull aerial noises. Some damage was done in this district, and the inhabitants had to quit their houses.	Pilla, <i>loc. cit.</i>
— 20. Sienna and its neigh- bourhood.		Very violent .....			Moniteur and v. Moll, <i>loc. cit.</i>
— 22. Tiflis .....		Some slight shocks...		During a storm .....	Dubois de Montpéroux, <i>loc. cit.</i>
— 23. In the island of Jersey, and at St. Malo, and several French sea- ports.		Renewed shocks .....		Perhaps only a mistaken account of the event of <i>Sept. 23.</i>	v. Moll, <i>loc. cit.</i>
Nov. 6. Tiflis .....		A violent vibration...		On the morning of the 7th the first snow fell ...	Dubois de Montpéroux, <i>loc. cit.</i>
— 10. Region about Vesuvius..		A violent shock .....		The volcano had been pretty quiet for some weeks, but immediately after this shock it burst forth into eruption. On the 24th the stream of lava had sensibly diminished.	Hamb. Corresp. Nr. 207, Beil.
— 14. Tiflis .....		Three shocks, of which one was violent.		Much snow fell during the night .....	Dubois de Montpéroux, <i>loc. cit.</i>
— 17. Valley of Elsa in Tus- cany, and the other places mentioned to- gether above.		One shock .....		Caused no damage .....	Hamb. Corresp. 1806, Nr. 3.
— 18. Leghorn .....		Another severe shock. The undulations ap- peared to come from the S.W.			Pilla, <i>loc. cit.</i>
— 19. Leghorn .....		Two slight shocks, the first more consider- able than the second.			Journ. des Débats, 13 Nivôse; Mo- niteur, 1 Pluviôse, an. 13.

12. Vale of Clwyd in North Wales.	A third was suspected about 4 P.M. Lasted two or three seconds.				Gentleman's Magazine, vol. lxxv. p. 173.
Leghorn	Vibratory				v. Moll's Annalen, Bd. v. S. 328.
11. Vitré (Ille et Vilaine) A.M.	One shock; several, however, were felt at other places near.				Journ. des Débats, 4 Ventôse; Moniteur, 5 Ventôse, an 13; Cotte.
— Sigmaringen in Swabia.	One shock				Cotte.
21. Tiflis in Georgia A.M.	An earthquake, lasting nearly half a minute, and consisting rather of oscillations ( <i>balancements</i> ) than of actual shocks. Followed by slight shocks at 5 <sup>h</sup> 30 <sup>m</sup> A.M., and another slight one at 10 P.M.				Dubois de Montpéroux, <i>loc. cit.</i>
21. Innsbruck	A violent shock				
In England	Vibratory shocks				Hamb. Corresp. Nr. 59, Beil. v. Hoff.
9. Strasburg, Bischweiler, and Hagenu.	A slight vibratory shock.				Hamb. Corresp. Nr. 85.
10. Tönningen in Jutland.	An earthquake shock was supposed to have been felt.				Ditto, Nr. 77, Beil.
16. Again at Bischweiler, Hagenu, and the surrounding district.	Vibratory, in the direction of the course of the river Moder.				Ditto, Nr. 85.
21. In Kamtschatka	Shocks during a min.				Ditto, Nr. 146; Moniteur, 21 Sept. 1806.
30. Ditto	Renewed shocks, more violent than the former, and lasting several minutes.				Ditto.
3. Island of Candia. Also felt in Sicily.	An earthquake consisting of four severe shocks in the space of 8 minutes.				Hamb. Corresp. Nr. 147; v. Moll's Annalen, Bd. vi. S. 538; Cotte; Kefenstein; Moniteur, 18 Fruct. an. 13.

1.	2.	3.	4.	5.	6.
July 3.	About Etna .....	.....	.....	Perhaps the shocks in Sicily mentioned by Cotte and Keferstein as contemporaneous with those in Candia, are the same with the earthquake here given.	Ann. de Chim. et de Phys. t. xxi. p. 400.
— 24.	Eisenartz in Styria .....	Three vertical shocks at the hours mentioned without oscillation.	.....	The air was calm and close. At noon rain began, which lasted all the following night.	Moniteur, 2-8 and 12 Fruct. an 13; Journ. des Débats, 4 Fruct.; Hamb. Corresp. Nr. 131; Cotte.
— 26.	Rome .....	Slight shocks. The motion appeared to come from the Apennines.	.....	.....	Journ. des Débats, 28-30 Thermidor, 7, 8, 11, 21, 23 Fructidor, an 13; 3, 11 Vendém. an 14; Moniteur, 27 Thermidor, 3, 4, 12, 16, 18, 24, 29 Fructidor, 1 complém. an 13; 11 Vendém. an 14; Bibl. Brit. t. xxix. p. 389, et t. xxx. p. 225; Journ. de Phys. t. lxi. p. 225; v. Buch, Canar. Inseln, S. 333; v. Moll's Annalen, Bd. vi. S. 538; Hamb. Corresp. Nr. 135, 136, 137, 140.
— 7 <sup>m</sup> , 11 <sup>m</sup> and $\frac{2}{3}$ after night.	Naples, and throughout La Puglia, Calabria, and the Terra-di-Lavoro. Most violent in the province of Molise, and extending even to Rome.	A most destructive earthquake. At Naples three shocks at the hours mentioned. The first lasted 45 to 50 seconds, with increasing intensity, in the direction N. to S. The second shock was less violent, and the third still less so. Three more shocks were felt during the three following days. According to other accounts, the first shock at Naples consisted of several di-	About 10 p.m. the sea at Naples was agitated, small eddies or whirlpools were observed at the surface, and a person bathing felt the sand move beneath his feet, and saw a shoal of fish swimming on the surface of the water.	The heat at Naples was most oppressive. At 7 in the morning there had been a storm from the N.W., and at 8 <sup>h</sup> 30 <sup>m</sup> in the evening a cool breeze from the N. blew for an hour. The heavens were clear, but a slight mist covered the surface of the ground. The barometer stood at 29.9 inches. Some buildings in Naples were injured, and a few fell. In La Puglia and Calabria these shocks were but slightly felt, but to the north of Naples they were very violent. In the Terra-di-Lavoro, Aversa, Capua, and Caserta were most injured. In Molise the town of Isernia became a heap of ruins. Avellino, Benevento, and Bojano in Capitanata suffered greatly. On the east of the Apennines, Campobasso, S <sup>a</sup> Agatha, Aquila and Chieti experienced some damage, the last being the most northern place where the earthquake seems to have been sensible.	Ditto.



26. Some of the Antilles, especially Antigua.	distinct blows, separated by undulatory motion, and lasting altogether 68 secs.	At Foggia also some damage was done. Soon after the shocks, the water of a spring on the mountain of Cassino became sulphureous. At Bojano a lake appeared. Vesuvius merely sent forth smoke during this earthquake, but after the second shock a double explosion as of cannon was heard from the mountain. In this month Etna burst into eruption. Antigua suffered most from these shocks	Hamb. Corresp. Nr. 156.
11. East Haddam, Connecticut.	Several shocks		
— Around Vesuvius.	Two slight shocks		Silliman's Journal, vol. xxxix. p. 339.
14. In the province of Molise, kingdom of Naples.	Some slight shocks		
18. Ditto	One shock	Followed, the next day, by an eruption of extreme violence. The lava especially was of most unusual fluidity, and traversed a space of 26,000 Neapolitan palms (= 22,360 Engl. feet) in five hours.	v. Buch, Geogr. Beobacht. auf Reisen, u. s. w. Th. ii. S. 218.
15. Island of Oléron	Two shocks at the hours mentioned.		Journ. des Débats, 3 Vendém.; Moniteur, 7 et 11 Vendém. an 14.
19. Eger (in Bohemia?)	Ditto		Ditto.
13. Naples and the neighbouring country.	Vibratory		Journ. des Débats, 4 et 5 complém. an 13; Cotte.
At Constantinople	An earthquake	At Capua and Nola several buildings fell. On the 15th Vesuvius was in eruption. Accompanied by an epidemic	Cotte. Journ. des Débats, 14 Frum.; Moniteur, 15 Frum. an 14. Moniteur, 18 Février, 1806.
30. Coire in the Grisons	Several shocks		Journ. des Débats, 2, et Moniteur, 3 Nivôse, an 14; Cotte.
26. In the district of Bulte near Hanover.	A vibratory shock	Accompanied by a loud explosive noise	Hamb. Corresp. 1806, Nr. 2.
30. East Haddam, Connecticut.	A slight shock		Silliman's Journal, vol. xxxix. p. 339.
In the Morea	An earthquake		v. Hoff.
Sta Fé di Bogota in Colombia.	A violent earthquake.	From this year until 1807 there were repeated eruptions of the volcano of Italco in Guatemala. (Annalen der Physik, Bd. lxxvii. S. 539.)	Allgemeine Zeitung, 1826, Nr. 260, Bell, S. 1042.



	2.	3.	4.	5.	6.
Jan. 20. — at mid- between	Orgon in the department Bouches-du-Rhône.	Two shocks in 20 secs., the first of which was much more violent than the second.	.....	Accompanied by a dull noise, like the explosion of cannon, at each shock. Cotte gives the date Jan. 19.	Journ. de l'Empire, 20 Févr.; Cotte.
— between id 24.	Poitiers .....	Two very severe shocks, the second less so than the first. Direction S. to N.	.....	Both accompanied by a dull and prolonged sound.	Journ. de l'Empire et Moniteur, 13 Févr.; Cotte.
Mar. 2. —	Novellara in Italy	Rather violent shocks.	.....	Some houses were injured	Cotte in Journ. de Physique, t. lxxv. Moniteur, 6 Mai; Journ. des Dé- bats, 7 et 26 Mai; Cotte.
April 9 10.	Reggio and other places in Calabria Ulteriora.	.....	.....	.....	Cotte, <i>loc. cit.</i>
May 1. —	Barbadoes .....	An earthquake .....	.....	The eruption which occurred this day was pre- ceded by the shock. It perhaps occurred a day or two before.	Ann. de Chim. et de Phys. t. xxi. p. 400. Moniteur, 26 Juin.
— 27. — — 31?	At Erna .....	A slight shock .....	.....	The houses were much shaken .....	Journ. des Débats, 5 Juillet; Cotte.
June 19. — en 11 and mid-	Nice .....	A severe shock .....	.....	.....	Journ. des Débats et Moniteur, 11 et 14 Août, 25 Févr. suiv.; Cotte.
July 21. — 5 <sup>th</sup> P.M.	In the kingdom of Na- ples.	At Naples the shock was slight, but more severe at Molise and Sora.	.....	.....	Ditto.
— 26. —	Ditto .....	Another shock .....	.....	.....	Moniteur, 26 Oct.; Journ. des Dé- bats, 3 Déc.
Aug. 8. — A.M. or P.M. (?)	Krasnojarsk in Siberia ..	A terrible shock, last- ing 4 min. 15 sec.; followed by a second a little later.	The river Jenissei in- undated its banks.	A violent storm intervened between the two shocks. A mountain at the distance of 12 wersts from Krasnojarsk was replaced by a lake of 300 feet in circumference and 180 feet in depth in some places, the water in which had the taste and smell of sulphur. The coun- try was covered with volcanic ashes.	.....
— 26 to 30.	Rome and its neighbour- hood, extending as far as Naples. The centre of disturbance appear- ed to be the mountain of La Fajola.	Violent shocks, con- stituting the most terrible earthquake which Rome had experienced since 1703.	.....	Caused great damage. One shock was so violent that the senator Lucien was thrown out of his bed. At the mountain of La Fajola a lake of sulphurous water was formed.	Journ. des Débats, 15 et 25 Sept.; Moniteur, 16 et 26 Sept.; Cotte.

1806, Sept. 22, 8 <sup>h</sup> 45 <sup>m</sup> P.M.	Presburg, Pesth, and Buda, Hungary. Also felt at Komarom (Komorn?).	Two shocks.		The weather was calm	Journ. des Débats, 12 et 15 Oct.; Moniteur, 12 Oct.; Cotte.
— Oct. 6.	Gence in Calabria Ultra.	A severe shock			Moniteur, 14 Nov.
— — 10.	At Etna	An earthquake			Ann. de Chim. et de Phys. t. xxi. p. 400.
— Nov. 1 to 18.	Grenada in Spain	Violent shocks		Several houses were injured; and a village was ruined, and replaced, it was said, by a new river.	Moniteur, 1-4 Déc.; Cotte.
— — 28.	Komarom (Komorn?) in Hungary.	Another earthquake			Férussac, Bull. des Sciences Naturelles, t. xviii. p. 195.
— Dec. 12.	Bâle	A violent vertical shock, lasting three seconds.		The weather was calm	Mérian. Journ. des Débats, 27 Déc.; Moniteur, 28 Déc.
— — 17.	Ulm	A violent vertical shock, lasting three seconds.			Journ. des Débats, 11 Janv.; Moniteur, 12 Janv. 1807; Cotte.
— — 18 and 19.	Bitonto and Trani in the kingdom of Naples.	A violent shock from S. to N.			Journ. des Débats, 21 Janv. 1807; Cotte.
— — 25.	Throughout the Terra-di-Bari, kingdom of Naples.	Several severe shocks.			Moniteur, 19 Férr. 1808.
— At the end of the year.	At the Bleale and Arles in the departm. Haute-Loire.	A slight shock.			Journ. des Débats, 25 et 31 Janv.; Moniteur, 31 Janv., 5 et 19 Férr.
1807, Jan. 14 and 15.	Pau in the Pyrenees	Three rather violent shocks.			Ditto.
— — 15.	Bayonne and the environs.	A shock in the direction S.W. to N.E. At Sarrance there were five shocks.			Moniteur, 25 Férr.
— Night of 27 and 28.	In the territory of Mo-lise, kingdom of Naples.	A shock of four sec. duration; nearly as violent as that of the 26th July preceding.			A catalogue communicated to M. Perrey by M. Studer, Professor of Geology in the University of Berne. Ann. de Chim. et de Phys. loc. cit.
— Feb. 19 and 20.	Darmstadt				
— (At night?)					
— — 24.	At Etna	Another shock of earthquake.			

1.	2.	3.	4.	5.	6.
Feb.	Cahors in the departm. Lot.	A shock from the S.E., but slightly felt.		Probably the same as that of Feb. 8, 1808	Delpont, Statistique du Lot, t. I. p. 108.
—	Janina in Epirus	One earthquake shock during this month.		M. Pouqueville says that this country (Epirus) is perhaps the district of Europe in which earthquakes are most frequent. The shocks, according to him, do not extend more than 20 leagues from the sea, and are stopped at the foot of Mount Pindus, so that they are never felt in the Polyanos, at Calarites, at Syraco, or in the higher regions where the rivers take their rise.	M. Pouqueville in Ann. de Chim. et de Phys. t. xlii. p. 408.
Mar. 30.	In the northern part of the Puy-de-Dôme.	A severe shock, ex- tending over a sur- face of about 4 my- riamètres in length.		Some old ruins were thrown down, and clocks were stopped.	Journ. des Débats, 30 Avril; Moni- teur, 1 Mai.
—	Janina in Epirus	On four days during the month shocks occurred.			Pouqueville, <i>loc. cit.</i>
April.	Ditto	Fire days in this month were marked by shocks.			Ditto.
May.	Ditto	Shocks on four days.			Ditto.
June 6.	Lisbon. Also at Oporto, and in other parts of Portugal.	A violent shock, said to be comparable to the great one of 1755, and followed immediately by a second. Duration = 10 or 12 seconds. The motion was horizontal and ver- tical, but badly ob- served.	The sea remained calm. The shock was felt on board a frigate 8 leagues off the Rock of Lis- bon.	No disasters ensued from this earthquake. The Annual Register gives the date 6th July, and says that several houses were thrown down.	Journ. des Débats, 28 et 30 Juin; Moniteur, 29 Juin; Annual Re- gister, vol. i. p. 174.
—	17. Eglsau in the canton of Zurich.	An earthquake			M. Studer's catalogue quoted above.
July 14.	Lahr or Lohr in Swabia.	A rather violent shock.		Some of the buildings rocked violently	Journ. des Débats, Juillet 30; et Moniteur, 31 Juillet.
August.	Janina in Epirus	One shock during the month.			Pouqueville, <i>loc. cit.</i>

1807. Sept. 5. 1 <sup>h</sup> 4 <sup>m</sup> A.M. (At Coni, 1 <sup>h</sup> 30 <sup>m</sup> .)	Genoa, Nice, and the country for six leagues round.	A slight shock	The Rhine was agi- tated, and fish leaped out of the water.	The first shock was scarcely felt in houses situated on the north side of a street, while those on the other rocked violently; accompanied by a noise like that of a carriage rolling rapidly on pavement. Immediately after, the wind ceased, and the sky became overcast with clouds.	Journ. des Débats, 15 Sept.; Moni- teur, 16 et 30 Sept.
11. 8 <sup>h</sup> 30 <sup>m</sup> P.M., midnight, and 3 the next morning.	Newied on the Rhine.	The first of the three shocks felt was violent, horizontal, and in the direction S.W. to N.W. (?) The two others were lighter, the third being the least violent of all. Shocks on two days of this month.			Journ. des Débats, 27 Sept.; Moni- teur, 28 Sept. et 9 Oct.; Gentle- man's Magazine, vol. lxxvii. p. 964.
—	Janina in Epirus	Some slight earth- quake shocks.			M. Pouqueville, <i>loc. cit.</i>
— Oct. 1. 2 A.M.	Vienna	A violent shock, fol- lowed by others each night up to the 26th.		Accompanied by a terrible tempest	Moniteur, 16 Oct.
— Nov. 18.	Algiers	Another vibration A rather violent shock from N.E. to S.W.		Buildings were thrown down	Journal de l'Empire (same with Journ. des Débats), 22 Févr.; Moniteur, 21 Févr. et 15 Mars, 1808.
— 25. — Dec. 19. 2 <sup>h</sup> 30 <sup>m</sup> A.M.	At Etua Biele, and in the moun- tains of Oropa, Lom- bardy.	Two shocks		At Ivrea the shock was most strongly felt in the lower parts of the town and near the river. Doors were thrown open, and pictures fell to the ground. Preceded by a noise like that of a great num- ber of carriages rolling over pavement. The weather was calm and hazy. Accompanied by a remarkable meteor	Ann. de Chim. et de Phys. <i>loc. cit.</i> Vassali-Bandi, <i>loc. cit.</i> pp. 64 et 131.
— 3 A.M.	Dusseldorf and its envi- rons.	Several shocks			Journ. des Débats et Moniteur, 1 Janv. 1808.
— 1808. Jan. 8. Feb. 8.	Weston, Connecticut Dunnichen in Scotland. Brioude in the depart- ment Haute-Loire.	A shock in the direc- tion N to S, follow- ed, a few minutes afterwards, by an- other of less vio- lence. At Cahors the motion was rather violent, and lasted two or three seconds.			Silliman's Journal, vol. xxxix. p. 336. Mém. de Chronol. t. ii. p. 932.
4 <sup>h</sup> 30 <sup>m</sup> A.M. (4 <sup>h</sup> 45 <sup>m</sup> at Cahors.)	felt at Cahors, Nîmes, Montpellier, Saumur, and slightly at Bleale and Ardes.			The first shock was accompanied by a disturb- ance of the air like that caused by a cannon- shot. Several people suffered from a violent headache in consequence.	Journ. des Débats, 16, 19, 20 et 21 Févr.; Moniteur, 19 Févr.; Tra- vaux de l'Acad. du Gard. An. 1808, p. 180.

1.	2.	3.	4.	5.	6.
Feb. 27, 28 3 <sup>rd</sup> mid-	Semlin and Belgrade ...	Three rather violent shocks.			Journ. des Débats, 29 Mars; Moniteur, 30 Mars.
—	Janina in Epirus .....	One shock during the month.			Ponqueville, <i>loc. cit.</i>
Mar. 4.	Ile Dieu (off the coast of Poitou).	A violent shock, lasting 14 seconds.		Two enormous masses of rock fell into the sea ..	Journ. des Débats et Moniteur, 28 et 29 Mars.
— 27.	Strasbourg .....	A violent shock .....		A strong wind was blowing .....	Moniteur, 1 Avril; Journ. des Débats, 2 Avril; Studer.
— 28.					Vassali-Eandi's account of these shocks, addressed to the Imp. Acad. of Turin, 1808; Journ. des Mines, t. xxiii. p. 209; Journ. des Débats, 9, 11, 12, 14, 15, 19, 24, 25, 26 Avril, et 2 6, 9 Mai; Moniteur, 9, 10, 11, 13, 14, 15, 16, 17, 19, 23, 25, 28, 29 Avril, et 3, 5, 7, 10, 18 Mai; Correspondance Vaudoin; Studer's catalogue.
April 2.	In Piedmont, throughout the valleys of the Palice and Clusone, and as far east as Milan; extending over almost the whole valley of the Rhone, as far as Montbrison and Berné. The centre of disturbance seems to have been at Pignerol.	More violent in Piedmont than further N. and W. The directions given are N.W. to S.E. at Turin, N.E. to S.W. at Nice, S. to N. at Chambéry, N. to S. at Grenoble, S.S.W. to N.N.E. at Gap, and E. to W. at Briançon and Mar-seilles. At Chambéry the duration of the motion was estimated at 10 to 15 seconds, at Grenoble about 40 secs., at Gap 30 secs., at Mar-seilles 3 shocks in 19 secs. (the first was the slightest, and lasted 4 secs.; an interval of 2 secs. then elapsed, followed by the second shock, of 8 secs. duration; then another interval of 2 secs.; and finally the	At Marsailles it was said that the water in the canal of the arsenal experienced a triple flux and reflux, so that the water rose about 6 inches above the mean level of the sea.	This very severe shock, the first of the many felt in Piedmont during April and May, caused some damage to buildings at places in the north of Italy. These shocks seem, according to M. Muthaon, to have taken the general direction N. to S. or S. to N. in the district from Pignerol to La Prouse, or rather S.W. to N.E., parallel to the Alps. At Turin the shocks were much less frequent. Some were accompanied by noise, others not. The former seemed to shake the houses more violently than the latter, even when the actual motion of the earth was slighter. The noise always immediately preceded the shock. The effects varied greatly between places at short distances from each other. In general the motion was felt more distinctly in houses built upon solid rock, but those standing on loose foundations suffered most actual injury. It was also remarked, that buildings, like bell-fries, which had small bases were generally but little injured. It was observed that a number of walnut-trees, torn up by the violent gusts of wind, had their trunks all directed towards the north, though this probably had no connexion with the earthquake. Several luminous meteors were seen during the period of these shocks. The inhabitants of the valleys of the Clusone and Palice declared at the time that the beginning	

third shock, which lasted 3 sec.), at Aix two shocks in 5 sec. At Abries 30 shocks were felt on this day.

of spring was ordinarily marked by slight shocks.

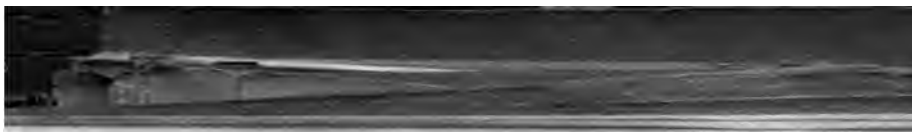
At the time of this first shock, at Chambéry the wind was cold and violent from the N.W. There had been a little snow at 4 and 5 p.m. The barometer at noon stood at 27 in. 1.2 line, and at 8 p.m. at 27 in. 2.2 lines. At the hospice on Mont Cenis several articles of furniture were displaced, and a noise like that of carriages was heard at the same time. At Geneva a bell was caused to sound. At Grenoble also a bell sounded twice, loudly and distinctly. At Mâcon and Montbrison the shock was slight. At Gap the great bell of the town sounded, and bells rang in many rooms. Several houses were injured at St. Jacques and in the hamlet of Sechier. At Corps and several other communes of the Upper Alps, the shock was preceded by a noise in the air like the collision of an innumerable number of stones. At Briançon 7 or 8 chimnies and some old walls were thrown down, and the large bell sounded thrice. At Abries a part of the belfry fell. At Marseilles the sky was clear, the thermometer stood at 4° below temperate, and the barometer, which had been at 28 inches, fell suddenly 2 lines, rising again during the following night to 28 in. 3 lines. The wind sensibly abated after the earthquake. The sky became clouded during the night, and some drops of rain fell in the afternoon of next day. At Toulon the machine for putting masts on board vessels (shears?) was raised more than an inch above its ordinary position by the shock. In Piedmont generally at the time of this first shock the weather was fine, settled, and dry: the nights were cold, and rain was much wished for, both for agricultural purposes and to supply the wells, which were for the most part dry.

1.	2.	3.	4.	5.	6.
April 2. 5 <sup>th</sup> P.M. Mont s at 9 <sup>h</sup> . riancon h 30 <sup>m</sup> . also at run.	The valleys of Piedmont above mentioned, the centre being, accord- ing to Vassali-Eandi, at Abries.	Less violent than the former shock.		Accompanied on Mont Cenia by the same noise as before.	Authorities quoted above (on the 2nd).
3. At La Tour		Moderate.			Ditto.
0 <sup>m</sup> A.M.	Barga	Ditto			Ditto.
.M.	Ditto	Severe. There were several other shocks during the day.		A dull tremulous noise was frequently heard during the day.	Ditto.
u.	4. Ditto	Moderate.		Besides the shocks mentioned, slight tremulous motion was very frequent at this place, as well as the noise like a subterranean can- nonade, which recurred on the following days.	Ditto.
	Ditto	Ditto			Ditto.
.M.	Ditto	Ditto			Ditto.
u.	Ditto	Ditto			Ditto.
u.	Ditto	Severe			Ditto.
u.	Ditto	Moderate. From the 2nd to the 4th there were seventy-five shocks felt at La Tour; they appear- ed to come from the east.			Ditto.
night.					
	5. Ditto	Moderate.			Ditto.
u.	Ditto	Ditto			Ditto.
.M.					

808. April 5. La Tour .....	Slight. Other slight shocks had been felt during the night between the 4th and 5th.			Ditto.
— Barga .....	Severe .....			Ditto.
6 P.M. —	Several slight shocks.			Journ. des Débats, 28 Avril; Moniteur, 29 Avril.
1 P.M. —	Slight but very numerous shocks during the day.			Vassalli-Bandi's Account, &c.
— 7. Ditto .....	Ditto .....			Ditto.
— 8. Pignerol .....	Moderate. Forty shocks had been counted since the 2nd.		At Barga there were subterranean noises like explosions of cannon heard during the day, but no motion was felt. In the evening a terrible storm, which lasted about three hours.	Ditto.
11 <sup>h</sup> 30 <sup>m</sup> P.M. —				Ditto.
— 9. Barga .....	Moderate. Several other slighter shocks were observed.			Ditto.
6 A.M. —	Ditto .....			Ditto.
— 9 P.M. —	Ditto .....			Ditto.
— Pignerol .....	Ditto .....		Preceded by a loud noise, as usual	Ditto.
11 P.M. —	Ditto .....			Ditto.
6 A.M. —	Slight .....			Ditto.
10 <sup>h</sup> 38 <sup>m</sup> A.M. —	Rather severe .....		Slight tremblings and noise were frequent during the day. Since the 2nd of the month the shocks appeared to decrease in violence at this place, whereas they recovered their intensity in some degree in the valley of the Po.	Ditto.
— La Tour .....				Ditto.
— Barga .....	Slight .....			Ditto.
11 A.M. —	Ditto .....			Ditto.
— 3 P.M. —	Ditto .....			Ditto.
— 9 P.M. —	Two rather severe shocks.			Ditto.
Also at 9 P.M. —				



	2.	3.	4.	5.	6.
Apr. 11. La Tour minutes of the	La Tour	Violent			Vassali-Eandi's Account, &c.
0 <sup>h</sup> 10 <sup>m</sup>	Briquerasque	A shock of greater severity than that of the 2nd.			Ditto.
—	Ditto	Slighter than the last.		Slight noises were heard during the day	Ditto.
1.	Barga	Slight			Ditto.
1.	Ditto	Ditto			Ditto.
1.	Ditto	Moderate		Several other feeble shocks during the day	Ditto.
1 <sup>m</sup> A.M.	La Tour	Ditto. Similar shocks recurred during the day at intervals of about three hours. Rather violent.			Ditto.
—	Perouse			There was a storm accompanied by thunder in Ditto. the evening, followed by snow.	Ditto.
1.	La Tour				Ditto.
1.	Ditto				Ditto.
M.	Ditto				Ditto.
M.	Ditto	our moderate shocks			Ditto.
13. Ditto morn-					
—	Barga	A slight shock			Ditto.
M.	La Tour, Villars, and Bobbi.	Severe			Ditto.
M.	Ditto	Ditto			Ditto.
M.	Briquerasque	Slight			Ditto.
1.					



14. La Tour	Rather severe. There had been two feeble shocks during the morning, and twelve were reckoned in the course of this day and the following night.		Ditto.
— Briquerasque	A disastrous shock		Ditto.
— La Tour	Severe		Ditto.
— Revel or Revello	A violent shock, lasting two seconds.		Ditto.
— Barga	Moderate		Ditto.
— La Tour, and Lucerne	Very severe	More damage was caused by this shock	Ditto.
15. Revel, Paesana, Barga, Cavour, and Lucerne. Also at La Tour, Turin, Saluces, &c.	Ditto	At the first-named places some damage resulted, at the last three however there was none.	Ditto.
— Pignerol	Ditto. Followed by other shocks up to about 5 A.M.	Fresh damage done. The inhabitants quitted their houses.	Ditto.
— Gap and Briançon			Ditto.
— Briquerasque	A rather severe shock, preceded by some slight ones in the morning, and followed by some tremulous motion during the evening.		Ditto.
— Turin	Moderate		Ditto.
— Barga, Nice, Revel, and in the valleys of Bronda, Wruita, and Maira, and those of the Po.	Severe. Lasted three seconds at Barga, at which place a wall oscillated from W. to E. Several	The damage caused by the shock of the 2nd was renewed almost everywhere by this one.	Ditto.

	2.	3.	4	5.	6.
		other shocks were felt there during the day. At Nice the shock was from N. to S., and lasted also three seconds. At Revel it lasted eight or nine secs. Severe			
Apr. 15, 1 <sup>st</sup> P.M.	Pignorol				Vassali-Bandi's Account, &c.
3 <sup>rd</sup> P.M.	Ditto	Still more severe.			Ditto.
9 <sup>th</sup> P.M.	Ditto	Similar to the last			Ditto.
— 16. M.	La Tour	Slight			Ditto.
— M.	Ditto, and at St. Jean, and higher up the valley. Also at Nice.	Very violent. At Nice the shock was rather severe, from N. to S., and lasted 3 secs.		Fresh ruins were produced. Followed by continual dull rumbling noise and slight tremblings up to 5 <sup>h</sup> 30 <sup>m</sup> A.M.	Ditto.
— 5 <sup>th</sup> A.M.	Fenestrelle. Also felt at Geneva, Grenoble and Turin, and as far as Marseilles and Antibes.	At Fenestrelle this shock was very severe, and seemed to last longer than that of the 2nd. At Turin the motion was undulatory, from S.W. to N.E. (or W. to E.), and lasted 8 seconds, during which time there were four distinct shocks.			Ditto.
— 3 <sup>rd</sup> A.M.	Acqui	Very severe			Ditto.
— 0 <sup>th</sup> A.M.	Barga	Severe, lasting more than eleven secs.		The wells were troubled, and some buildings were injured.	Ditto.
— 0 <sup>th</sup> A.M.	Ivrée, and throughout the department.	A severe shock, lasting twenty seconds.		No damage resulted from this shock	Ditto.

16. Briquerasque .....	Another severe shock. At Cavour there were two shocks between midnight and morning. Moderate.	.....	Accompanied by dull noises which continued on the following days. The inhabitants quitted their houses.	Ditto.
17. Nice.....	Ditto. Direction at Embrun and Briançon = S.S.W. to N.N.E., lasting 12 secs. At Corps, fifteen oscillations were reckoned in 22 secs., the latter ones terminating by a kind of bound. Slight. Duration = 3 secs.	.....	It was remarked that the shocks were felt most violently in valleys among the mountains.	Ditto.
— Ivree .....	.....	.....	.....	Ditto.
— Crisolto, and near the Pic de Viso.	.....	.....	.....	Ditto.
— Cavour.....	Two or three little shocks. At Barga several oscillations and more tremulous motion during the day.	.....	.....	Ditto.
— Ditto .....	Two little shocks.	.....	.....	Ditto.
18. Ditto .....	Another .....	.....	.....	Ditto.
— Nice.....	Moderate, from N. to S., lasting 3 secs.	.....	.....	Ditto.
— Cavour and Barga .....	Violent. Some more slight motion was felt about noon.	.....	At La Tour, at the same hour, two distinct detonations were heard, and a luminous meteor was observed.	Ditto.
— Fenestrelle. The first shock was felt also at Pignerol.	Three shocks .....	.....	At Fenestrelle some arches were injured. At Pignerol the inhabitants encamped in tents.	Ditto.
— Barga .....	Moderate.....	.....	.....	Ditto.
— M.	.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
Apr. 18. La Tour .....	Slight. Followed by another shock a little after, and by three more slight ones during the night.	.....	.....	.....	Vassali-Handi's Account, &c.
1 <sup>st</sup> A.M. — Barga .....	Moderate.	.....	.....	.....	Ditto.
— Ditto .....	.....	.....	.....	.....	Ditto.
M. — Ditto .....	Feebler.	.....	.....	.....	Ditto.
— La Tour .....	Four slight shocks. Several others during the day.	.....	.....	.....	Ditto.
it noon. — Barga .....	Slight	.....	.....	.....	Ditto.
M. — Ditto .....	Ditto	.....	.....	.....	Ditto.
— Ditto .....	Ditto	.....	.....	.....	Ditto.
M. — Pignerol .....	.....	.....	.....	.....	Ditto.
1 <sup>st</sup> A.M. — Ditto, and at Barga .....	Severe	.....	.....	The buildings suffered fresh injuries.	Ditto.
— Briquerasque .....	Ditto. Followed by several slighter shocks during the day and night.	.....	.....	.....	Ditto.
5 <sup>th</sup> A.M. — Lucerne and Saluces. Also felt at Pacalieri and La Tour.	Very severe. Direction at Lucerne N.E. to S.W. Several slight movements there during the following night. At Saluces the shock lasted 5 or 6 seconds. At Pacalieri and La Tour several others	.....	.....	Accompanied at Saluces by a dull noise. At Lucerne fresh ruins were produced.	At Ditto.
0 <sup>th</sup> A.M. —					

1808, Apr. 20.	Nice .....	had been felt during the preceding night.	.....	.....	.....	Ditto.
10 P.M.	21. Pignerol .....	Slight .....	.....	.....	.....	Ditto.
2 <sup>h</sup> 30 <sup>m</sup> A.M.	Barga and Briquerasque.	Rather severe .....	.....	.....	Two detonations heard during the following night.	Ditto.
5 A.M.	Saluces .....	Slight .....	.....	.....	.....	Ditto.
5 <sup>h</sup> 15 <sup>m</sup> A.M.	Pignerol .....	.....	.....	.....	.....	Ditto.
5 <sup>h</sup> 20 <sup>m</sup> A.M.	La Tour .....	Moderate .....	.....	.....	Dull rumblings were observed three or four times during the preceding night.	Ditto.
7 <sup>h</sup> 15 <sup>m</sup> A.M.	Ditto .....	Slight .....	.....	.....	.....	Ditto.
9 <sup>h</sup> 45 <sup>m</sup> A.M.	Barga .....	Three trifling shocks.	.....	.....	About 3 P.M. a waterspout passed over the territory of Marennas.	Ditto.
During the morning.	Ditto .....	Slight .....	.....	.....	A storm of thunder and hail during the day ...	Ditto.
Midnight.	Briquerasque and Pignerol, and at Revello.	Ditto. Most perceptible at Revello, where the earth trembled many other times during the day.	.....	.....	.....	Ditto.
6 A.M.	.....	.....	.....	.....	.....	.....
9 P.M.	24. Briquerasque .....	Severe; followed by two feeble shocks during the night.	.....	.....	.....	Ditto.
9 <sup>h</sup> 15 <sup>m</sup> P.M.	Barga .....	Very severe. Other slighter shocks during the day.	.....	.....	.....	Ditto.
At night.	25. Ditto .....	Slight shocks .....	.....	.....	.....	Ditto.
At night.	26. Ditto .....	Ditto. Similar ones felt at Pignerol during the day.	.....	.....	.....	Ditto.
7 <sup>h</sup> 45 <sup>m</sup> P.M.	Saluces .....	Slight .....	.....	.....	.....	Ditto.
11 <sup>h</sup> 30 <sup>m</sup> A.M.	.....	.....	.....	.....	.....	Ditto.

1.	2.	3.	4.	5.	6.
Apr. 27. 10 <sup>th</sup> P.M.	Barga .....	Slight .....	.....	.....	Vassali-Eandi's Account, &c.
— 28. M.	Pignerol .....	Rather severe .....	.....	.....	Ditto.
— M.	Briquerasque .....	Slight .....	.....	Accompanied by rumbling noise .....	Ditto.
— M.	Barga .....	Moderate .....	.....	Attended with subterranean noise lasting 30 seconds. ....	Ditto.
0 <sup>th</sup> A.M.	Ditto, and at Briquerasque .....	Slight at Barga, and still more so at Briquerasque. ....	.....	.....	Ditto.
— 29. M.	Pignerol .....	Two shocks of considerable severity. ....	.....	.....	Ditto.
— 30. M.	Briquerasque .....	Slight shocks, recurring at 4 A.M. ....	.....	.....	Ditto.
— 1 <sup>st</sup> A.M.	La Tour .....	Two rather severe shocks. ....	.....	.....	Ditto.
— 2 <sup>nd</sup> A.M.	Barga .....	Moderate .....	.....	Accompanied by noise like that of a cannonade, ending with two explosions. ....	Ditto.
— 3 <sup>rd</sup> A.M.	Pignerol .....	Very severe .....	.....	.....	Ditto.
— 15 <sup>th</sup> A.M.	La Tour .....	Slight .....	.....	Noises had been constantly heard at this place since the 24th, but no shocks, except the two on the morning of this day .....	Ditto.
— 0 <sup>th</sup> P.M.	Pignerol .....	Very severe .....	.....	.....	Ditto.
May 1. 5 <sup>th</sup> A.M.	Saluces. More perceptible in the valley of the Po. ....	Slight, in the direction W. to E. ....	.....	.....	Ditto.
— 0 <sup>th</sup> A.M.	Barga .....	Moderate. ....	.....	.....	Ditto.
— M.	Ditto .....	Ditto .....	.....	.....	Ditto.
— M.	Pignerol .....	A shock of greater intensity than that of 15 mins. past midnight. Some feebleness during the day. ....	.....	Accompanied by noise .....	Ditto.
— 5 <sup>th</sup> A.M.	.....	.....	.....	.....	.....

— Barga .....	Slighter than that of 1 A.M.		of the valley of the fault were more violently shaken and suffered more damage than others lower down towards the plain.	Ditto.
— 2. Ditto .....	Slight shocks .....		On this day a volcano opened in the island of St. George, Azores. The eruption was of great violence, and did not cease before the 5th of June. Philosophical Transactions of New York, 1815, p. 315.	Ditto.
— Ditto .....				Ditto.
— Ditto .....	This shock and the last were not equal in intensity to one-seventh of that at 2 A.M.			Ditto.
— Pignerol .....	Slight .....			Ditto.
— Briquerasque .....	Ditto. Several very slight shocks between midnight and morning.			Ditto.
— 3. Saluces. Also felt at Pagnu.	Undulatory, from W. to E.			Ditto.
— Coni .....	Violent .....			Ditto.
— Barga .....	Slight shocks; several were felt between 4 and 5 A.M.			Ditto.
— Briquerasque .....	Slight shocks .....			Ditto.
— 4. Barga .....	Very slight .....			Ditto.
— (A.M. ?) .....				
— Ditto .....	Ditto .....			Ditto.
— or .....				



1.	2.	3.	4.	5.	6.
Apr. 27. Barga .....	Slight .....				Vassali-Eandi's Account, &c.
0 <sup>m</sup> P.M. — 28. Pignerol .....	Rather severe .....				Ditto.
M. — Biquerasque .....	Slight .....			Accompanied by rumbling noise .....	Ditto.
M. — Barga .....	Moderate .....			Attended with subterranean noise lasting 30 seconds. ....	Ditto.
0 <sup>m</sup> A.M. — 29. Ditto, and at Biquerasque. ....	Slight at Barga, and still more so at Biquerasque. ....				
M. — Pignerol .....	Two shocks of considerable severity. ....				Ditto.
2 <sup>m</sup> A.M. — 30. Biquerasque .....	Slight shocks, recurring at 4 A.M. ....				Ditto.
M. — La Tour .....	Two rather severe shocks. ....				Ditto.
seen 2 3 A.M. — Barga .....	Moderate .....			Accompanied by noise like that of a cannonade, ending with two explosions. ....	Ditto.
M. — Pignerol .....	Very severe .....				Ditto.
15 <sup>m</sup> A.M. — La Tour .....	Slight .....			Noises had been constantly heard at this place since the 24th, but no shocks, except the two on the morning of this day .....	Ditto.
0 <sup>m</sup> P.M. — May 1. Pignerol .....	Very severe .....				Ditto.
5 <sup>m</sup> A.M. — Saluces. More perceptible in the valley of the Po. ....	Slight, in the direction W. to E. ....				Ditto.
0 <sup>m</sup> A.M. — Barga .....	Moderate .....				Ditto.
M. — Ditto .....	Ditto .....				Ditto.
M. — Pignerol .....	A shock of greater intensity than that of 15 mins. past midnight. Some feebleness during the day. ....			Accompanied by noise .....	Ditto.
5 <sup>m</sup> A.M. —					

— Barga .....	Slighter than that of 1 A.M.		shaken and suffered more damage than others lower down towards the plain.	Ditto.
— 2. Ditto .....	Slight shocks		On this day a volcano opened in the island of St. George, Azores. The eruption was of great violence, and did not cease before the 5th of June. Philosophical Transactions of New York, 1815, p. 315.	Ditto.
— Ditto .....				Ditto.
— Ditto .....	This shock and the last were not equal in intensity to one-seventh of that at 2 A.M.			Ditto.
— Pignerol .....	Slight			Ditto.
— Briquerasque .....	Ditto. Several very slight shocks between midnight and morning.			Ditto.
— 3. Salucea. Also felt at Pagnu.	Undulatory, from W. to E.			Ditto.
— 5 <sup>m</sup> Coni .....	Violent			Ditto.
— Barga .....	Slight shocks; several were felt between 4 and 5 A.M.			Ditto.
— Briquerasque .....	Slight shocks			Ditto.
— 4. Barga .....	Very slight			Ditto.
— (A.M. ?).				Ditto.
— L. or	Ditto			Ditto.

1.	2.	3.	4.	5.	6
May 5. M.	Barga, and at Brique- rasque.	At Barga a single shock; at Brique- rasque several very slight ones.			Vassali-Eandi's Account, &c.
— M.	Barga .....	Another slight shock.			Dit
— 30 <sup>m</sup> to M.	La Tour .....	Three slight shocks in the time mentioned. Nothing had been felt at this place for 48 hours before.		One of these shocks was accompanied by an ex- plosion like the report of a cannon.	Ditto.
— M.	Briquesasque .....	Slight .....			Ditto.
— M.	Pignerol, Barga, Cavour, and La Tour.	Very severe at Pigne- rol, and rather so at the three other places.		Preceded, at Pignerol, by three explosions appa- rently coming from Lucerne.	Ditto.
— 30 <sup>m</sup> P.M.	Pignerol .....	Very severe .....			Ditto.
— 6.	Ivrée .....	Rather severe. Lasted 10 or 12 seconds.			Ditto.
— 10 <sup>m</sup> A.M.	Briquesasque .....	Slight .....			Ditto.
— M.	Barga .....	Ditto .....			Ditto.
— ween 2 3 A.M.	Briquesasque and Pigne- rol.	Severe at Brique- rasque; more so at Pignerol than the shock of the night before.		At La Tour dull rumbling noises were heard to- wards the evening, which continued the whole night and following day.	Ditto.
— 20 <sup>m</sup> A.M.	La Tour .....	Moderate .....		Preceded by a kind of hissing sound, and fol- lowed by a rumbling noise about half an hour after.	Ditto.
— 30 <sup>m</sup> A.M.	Barga and Briqueasque	Slight shocks at Barga; at Briqueasque but one was felt.			Ditto.
—	Briquesasque .....	Another slight shock			Ditto.

10th.	Ditto	Some slight tremblings.	tible shocks.	Ditto.
11th.	Ditto	Slight undulations	Slight undulations	Accompanied by a rumbling noise, and explosions as of cannon underground.
12th.	Barga	Slight shocks	Slight shocks	Ditto.
13th.	Ditto, and at Pignorol and Briquerasque.	Ditto at Barga. At Briquerasque the motion was scarcely sensible, but at Pignorol it was very severe. There had been slight shocks at the latter place for some days before.	Ditto at Barga. At Briquerasque the motion was scarcely sensible, but at Pignorol it was very severe. There had been slight shocks at the latter place for some days before.	Ditto.
14th.	Briquerasque and La Tour.	Motion scarcely perceptible at Briquerasque. At La Tour the shock was slight and lasted 4 or 5 seconds.	Motion scarcely perceptible at Briquerasque. At La Tour the shock was slight and lasted 4 or 5 seconds.	Three loud explosions were heard at La Tour between 1 <sup>h</sup> 30 <sup>m</sup> and 3 <sup>h</sup> 30 <sup>m</sup> A.M.
15th.	Briquerasque	Some slight shocks.	Some slight shocks.	Ditto.
16th.	La Tour	Two more slight shocks.	Two more slight shocks.	Ditto.
17th.	Ditto	Slight movements five times within an hour.	Slight movements five times within an hour.	At Barga some slight rumbling noise was felt on this day, but no shock.
18th.	Pignorol	Slight. Similar shocks on the preceding days.	Slight. Similar shocks on the preceding days.	Ditto.
19th.	La Tour. Also at Briquerasque.	Moderate at La Tour. At Briquerasque slight shocks had been frequently felt	Moderate at La Tour. At Briquerasque slight shocks had been frequently felt	Rumblings had commenced at La Tour between 3 and 4 A.M., and recurred frequently during the day. Two, very loud, were heard at 3 <sup>h</sup> 30 <sup>m</sup> and 10 <sup>h</sup> 30 <sup>m</sup> P.M. The noises re-

1.	2.	3.	4.	5.	6.
		from midnight until the morning of this day, especially towards the mountains. They occurred at the hour here given and more freely at 9 P.M.		curled like explosions the next morning at 6 A.M., and were frequently heard during the day.	
May 13, 5 <sup>m</sup> A.M.	Pignerol	Very severe. Several others, feebler, during the day.			Vassali-Eandi's Account, &c.
— 2 <sup>h</sup> and 3 <sup>h</sup> A.M.	La Tour	Two very perceptible shocks.		All was quiet at this place during the remainder of the day, until 10 P.M., when an explosion was heard.	Ditto.
— 4 <sup>m</sup> A.M.	Pignerol	Another shock, similar to that of 2 <sup>h</sup> 45 <sup>m</sup> .			Ditto.
— 11 <sup>m</sup> A.M.	Ditto	Very perceptible			Ditto.
— 5 <sup>m</sup> A.M.	Ditto	Ditto. Both this and the last shock lasted rather a long time.		Accompanied, as was the last shock, by a prolonged noise.	Ditto.
— 9 <sup>m</sup> A.M.	La Tour	Slight		Accompanied by rather a loud noise. At 2 A.M.	Ditto.
— 10 <sup>m</sup> A.M.	Ditto	Slighter than the last.		a subterranean explosion.	Ditto.
— 15 <sup>m</sup> P.M.	Briquerasque	Undulatory motion lasting several hours.		At La Tour a single explosion was heard during the night.	Ditto.
— 16 <sup>m</sup> M.	The country lying along the river Pelice.			A red cloud hung over the river and the surrounding district; at the moment of the shock there was an odour of sulphur, and altogether became imperceptible four minutes afterwards.	Ditto.
— 17 <sup>m</sup> M.	Briquerasque	Very slight. Undulatory movements were also felt.		Buildings continued to suffer damage. Those which had been already propped up, had now to be still more strongly supported, in order to prevent their destruction. The catalogue of these shocks by M. Vassali-Eandi, from which	Ditto.

June 12.	Barga	A violent shock	A violent shock	Preceded by a noise like that of a rapidly driven carriage.	Journ. des Débats, 10 Juillet.
— 25.	Montalto-di-Chieri, A.M. Stura, Italy.	la Shocks.	la Shocks.	During a dreadful tempest	Ditto, 15 Juillet.
— 26.	In Iceland	A severe earthquake	A severe earthquake	A new hot spring made its appearance, and others ceased to flow for fifteen days.	Eyrið, Abrégé des Voyages modernes, t. vii. pp. 51 et 273.
July 1.	Turin	Two slight shocks	Two slight shocks	Accompanied by explosions	Journ. des Débats et Moniteur, 18 Juillet.
August 25.	At Mount Etna	Several shocks	Several shocks		Ann. de Chim. et de Phys. loc. cit.
— 26.	Pignarol	Another slight shock, which seemed to come from the S.E.	Another slight shock, which seemed to come from the S.E.		Journ. des Débats et Moniteur, 14 Octobre.
— 28.	Mount Etna	Several shocks during the month.	Several shocks during the month.	Ditto	Ann. de Chim. et de Phys. loc. cit.
— 22.	Pignarol	Three more shocks	Three more shocks	Some chimnies were thrown down by one of the shocks.	Journ. des Débats, 5 Nov.
— 26.	Leghorn	Several shocks	Several shocks		Journ. des Débats et Moniteur, 13 Nov.
— 28.	Pignarol	A rather severe shock.	A rather severe shock.	M. Perrey seems to think that the shocks at this place in September, October and November, present some indication of periodicity.	Journ. des Débats, 5 Déc.
— 21.	Marche in the department of Sambre-et-Meuse.	A shock of 2 or 3 seconds duration.	A shock of 2 or 3 seconds duration.	During the night of the 12th of this month a number of avalanches in Switzerland—an earthquake suspected. (Journ. des Débats, 9, et Moniteur, 10 Janv. 1809.)	Ditto, 4 Janv. 1809.
— 15.	Janina in Epirus	Shocks on one day during the month.	Shocks on one day during the month.	Accompanied by explosive noises	M. Pouqueville, loc. cit.
— 18.	Mount Etna	Several shocks during the month.	Several shocks during the month.	No damage done. Keilhau, quoting Keférstein, gives the date Jan. 19.	Ann. de Chim. et de Phys. loc. cit.
— 18.	Kionkable in West Gothland, Sweden.	Direction = N.W. to S.E.	Direction = N.W. to S.E.	Preceded and succeeded by a loud subterranean noise like thunder, lasting altogether about a minute. The atmosphere was calm, dense, and cloudy. The thermometer at 17° Fahr.	Moniteur, 1 Avril, 1809.
— 30.	Dunning in Perthshire	A slight shock	A slight shock	During a terrible tempest	Tilloch's Magazine, vol. xxxiii. p. 91.
— 30.	Courtraï	Shocks felt on one day during this month.	Shocks felt on one day during this month.		Moniteur, 5 Févr.
— 30.	Janina in Epirus				Pouqueville, loc. cit.

1.	2.	3.	4.	5.	6.
Jan. ...	Mount Etna	Shocks during the month.			Ann. de Chim. et de Phys. <i>loc. cit.</i>
Feb. 15.	Grenoble	One shock			Journ. des Débats, 20 Fév.
... ..	San Germano (where ?)	A shock of sufficient violence to make the inhabitants quit the town.			Ditto, 11 Mars; Moniteur, 12 Mars.
and 17.					
— ...	Mount Etna	Earthquake again during this month.			Ann. de Chim. et de Phys. <i>loc. cit.</i>
Mar. 13.	Pignerol and its neighbourhood.	Another shock		Preceded by a loud explosion	Journ. des Débats, 25 Mars.
0 <sup>m</sup> A.M.					
— 20.	Ditto	Ditto			Ditto, 31 Mars.
— 27.	Mount Etna	Another earthquake, the most violent of the year.		Accompanied by eruption of the volcano	Ann. de Chim. et de Phys. <i>loc. cit.</i>
April 26.	Berne	A feeble vibration			Catalogue of M. Studer.
M.					
— 30.	Cavour, in the arrond. Pignerol.	A violent shock			Moniteur, 13 Mai.
—	Etna				
May 3.	Island of Corfu	Many shocks		Houses were injured	Ann. de Chim. et de Phys. <i>loc. cit.</i>
ad 5.					Moniteur, 25 Mai et 19 Juin; Journ. des Débats, 18 Juin.
— 8.	At Naples	A shock			Moniteur, 25 Mai et 19 Juin.
— ...	Janina in Epirus	Three days during the month marked by shocks.		During a violent storm, Vesuvius was in eruption. Perhaps the days on which the shocks were felt in Corfu.	Pouqueville, <i>loc. cit.</i>
—	Etna				
June 26.	Pignerol	Another shock			Ann. de Chim. et de Phys. <i>loc. cit.</i>
— 29.	Thun, and in the Simmenthal, Switzerland.	Vibratory			Journ. des Débats, 11 Juillet.
July 2.	Dusseldorf and the neighbourhood.	Two shocks		Accompanied by a noise like that of carriages. Cattle bellowed in their stalls.	M. Studer's Catalogue.
10 <sup>m</sup> and 30 <sup>m</sup> A.M.					Journ. des Débats, 9 et 11 Juillet.
—	Suze in France	Slight shocks			Ditto.
— 3.	Pignerol	Two severe shocks	On the 4th an extraordinary flux and reflux of the sea		Ditto, 11, 17 Juillet et 4, 10 Août; Moniteur, 18 Juillet et 11 Août.

1809. Aug. 1. In the Abruzzi Ulteriora, at Aquila.	A severe shock, followed by twenty others before the following day. Undulatory motion continued at least up to the 5th.	noise territory, occurring at intervals of $\frac{1}{2}$ , $\frac{1}{3}$ , or 1 hour. A similar phenomenon near Lisbon on the same day, and at Naples on the 27th of the month ( <i>terremoto di mare</i> ).	Some springs appeared to boil up	Journ. des Débats, 21 Août et 2 Sept.; Moniteur, 24 Août et 3 Sept.
— 24. Teramo in the same district.	One shock			Journ. des Débats, 8 et 10 Sept.; Moniteur, 9, 12 et 19 Sept.
— 25. Macerata in the same region.	A violent shock of 8 or 10 secs. duration.		Houses were injured	Ditto.
— Janina in Epirus	Earthquake on one day of the month.			Pouqueville, <i>loc. cit.</i>
— Sept. ... Etna				Ann. de Chim. et de Phys. <i>loc. cit.</i>
— Oct. 26. Lisbon	A rather violent shock.			Moniteur, 2 Déc.
— Nov. 23. Copenhagen	A slight shock.			Ditto, 11 Déc.
Between 2 and 3 A.M.				
— Dec. 4. Cape Town, Cape of Good Hope.	Three shocks from N. to S.; followed, after an interval of ten minutes, by one more. The second shock was by far the most violent.	A heavy swell came into Table Bay after the shocks.	Accompanied by noises like the firing of several pieces of heavy artillery in quick succession, followed by a low rumbling. Immediately after the shock the wind changed from S.S.E. to N.N.W., and then ceased altogether. The sky became clear, and numerous meteors were observed.	Philosophical Magazine (continuation of Tilloch's Magazine), vol. ix. p. 72.
— 5. Ditto	Another shock		Accompanied, as before, by a noise like thunder.	Ditto.
7 A.M.				
— 12 <sup>h</sup> 30 <sup>m</sup> noon.			Ditto	Ditto.



1.	2.	3.	4.	5.	6.
Dec. 5. Cape Town, Cape of Good Hope.		Slight oscillation .....		Accompanied by a low rumbling noise. Very many people asserted that they felt the shocks on the bursting of the meteors, which were very brilliant, and seen by all. On the morning of the 5th, in Blauweberg's valley, several fissures opened in the earth, <i>some of them nearly a mile in length</i> , and varying in depth from 3 to 10 feet, and in breadth from 1 to 5 inches. Muddy water was thrown up to the height of 6 feet from some small holes which opened in the sandy soil of this place.	Philosophical Magazine (continuation of Tilloch's Magazine), vol. ix. p. 72.
— Etna.....		Two shocks, separated by an interval of some seconds.		Accompanied by a cracking noise. The ice of the Danube was broken. An astronomical clock was stopped, the pendulum of which did not move in the direction N.E. to S.W. Others, oscillating in this direction, were not affected.	Ann. de Chim. et de Phys. <i>loc. cit.</i> Journ. des Débats, 30 et 31 Janv., 13 Fév.; Moniteur, 29 Janv., 1 et 15 Fév.
Jan. 14. 3 <sup>m</sup> P.M.	Vienna.....			At Mount Czoka subterranean bellowings had been heard for eight days. Many buildings were thrown down, and several springs of mineral water made their appearance.	Ditto.
— 15 <sup>m</sup> and 16 <sup>m</sup> P.M.	In Hungary; the centre of disturbance was apparently the mountain Czoka.	The earth trembled violently. At Czackbering the shocks were very intense; 177 were felt up to the 19th.			
— 21.	Komarom (Komorn?) in Hungary.	Another earthquake .....			Férussac, Bull. des Sciences Nat. t. xviii. p. 195.
— 22.	Pignerol, La Tour, and Lucerne.	Another shock .....		Accompanied by an explosion. M. Perrey remarks that this is another instance of the periodical recurrence of the shocks of the district of Pignerol on the 22nd of the month.	Journ. des Débats, 4 Fév.
Feb. 3.	Czakwar in the territory of Stuhlweissenburg, Hungary.	Some shocks as violent as those of the 14th Jan.		Houses situated on a mountain were observed to be lighted up after the shocks; it was supposed by the reflexion of subterranean fire from some opening in the earth caused by the earthquake (?) (?).	Ditto, 13 Mars.
— 16.	Trieste.....	A rather violent shock.			Ann. de Chim. et de Phys. <i>loc. cit.</i> ; Journ. des Débats, 28 Fév., 6 et 14 Mars; Moniteur, 2 Mars.
— 3 <sup>m</sup> P.M.	Naples and Oranto .....	At Naples a shock .....		Vesuvius was tranquil, but loud noises were .....	Journ. des Débats et Moniteur

1810. Feb. 16. Malta .....	minute. At Otranto its violence was terrible; the inhabitants spent the night out of doors.	.....	.....	of which one was felt in Malta, in Africa (that here recorded), and even in the island of Cyprus.	.....	Moniteur, 2 Mai; Gentleman's Magazine, vol. lxxx. p. 371.
At night (probably about same time as at Naples).	The most violent shock felt up to that time in Malta. Lasted two minutes.	.....	.....	.....	.....	.....
— Nearly at same time with last event.	The town of Candia, in the island of same name.	.....	.....	The city was ruined, and 2000 persons perished.	.....	Huot, Géologie; Journ. des Débats, 19 Mai ("sous la rubrique de Candie, 26 Mars").
— 17. Naples .....	Another shock. Direction E. to W.	.....	.....	.....	.....	Journ. des Débats et Moniteur, loc. cit.
2 <sup>d</sup> 15 <sup>m</sup> A.M.	Two more shocks, less violent than the former one.	.....	.....	.....	.....	Moniteur, 2 Mai.
— Malta .....	A shock from N. to S.	.....	.....	.....	.....	Journ. des Débats, 23 Mars et 17 Avril; Huot.
— Mar. 16. Langres in the department of Haute-Marne, and Is-sur-Tille in the Côte-d'Or.	A very violent earthquake.	.....	.....	Many people perished beneath the ruins of the houses.	.....	Journ. des Débats, 4 Juin, 1810; Huot, Géologie, t. I. p. 114.
— 25. Island of Teneriffe .....	Some slight shocks still felt, but less frequently than before.	.....	.....	.....	.....	Moniteur, 9 Mai (sous la rubrique de Vienne, 24 Avril).
— and In Hungary .....	Two shocks from N.E. to S.W., the first lasting 6, and the second 30 sec.	.....	.....	.....	.....	Gentleman's Magazine, vol. lxxx. pt. 2. p. 378.
— April 8. Calcutta and other places in Bengal.	A very severe shock.	.....	.....	.....	.....	Journ. des Débats, 22 Mai; Moniteur, 23 Mai.
7 <sup>h</sup> 25 <sup>m</sup> P.M.	Two more shocks of great severity.	.....	.....	.....	.....	Pouqueville, loc. cit.
— 14. Moor in Hungary .....	Another shock	.....	.....	.....	.....	Journ. des Débats et Moniteur, 5 et 6 Juin.
— Janina in Epirus .....	.....	.....	.....	.....	.....	Moniteur, 7 Juillet.
— May 15. Moor in Hungary .....	.....	.....	.....	.....	.....	.....
— Ditto .....	.....	.....	.....	.....	.....	.....
June. ...	.....	.....	.....	.....	.....	.....
Beginning of the month.	.....	.....	.....	.....	.....	.....

1.	2.	3.	4.	5.	6.
une 25.	In East Gothland, Sweden.	A vibration lasting one second.			Moniteur, 31 Juillet; Journ. de l'Empire, 30 Juillet et 14 Août.
July 1.	In the neighbourhood of Nischneikantschatsk.	Several shocks.			Moniteur, 23 Juillet, 1811.
— 4.	Moor in Hungary.	Another shock.			
— between 17.	Sienna and Arezzo.	Two shocks, of sufficient severity to throw down articles of furniture.		Houses were thrown down. A terrible storm at Leghorn on the 7th.	Journ. de l'Empire, 10 Août. Moniteur, 26 Juillet.
— 13.	Moor in Hungary.	Another shock.			
— between 23.	Lubring in Croatia.	A severe shock.		Accompanied by subterranean noise like a clap of thunder.	Journ. de l'Empire, 10 Août. Moniteur, 25 Août.
— 23.	Ditto.	Another shock, less violent.			Ditto.
— 27.	Hermanstadt in Transylvania.	A very severe shock.		Accompanied by subterranean noise.	Journ. de l'Empire, 5 Sept.; Moniteur, 6 Sept.
— 28.	Ditto.	Ditto.		Ditto.	Ditto.
— 29.	Ditto.	Ditto.		Ditto.	Ditto.
— 30.	Ditto.	Ditto.		Ditto.	Ditto.
— and August.	San Miguel in St. Michael's, Azores.	Severe shocks.		The commencement of the violent disturbances which this island experienced in 1810-11. The authorities here given apply to both years.	Journ. de l'Empire, 11 Oct. 1810, et 27 Sept. 1811; Webster in Byrries, Nouv. Ann. des Voy. t. xvii. Janv. 1823, p. 48; v. Humboldt, Voy. aux rég. équinox. t. i. pp. 187, 377 et 391. t. v. p. 7; v. Buch.
Aug. 11.	Ditto.	Ditto. The shocks continued, though but slightly, up to January 1811.		The village of Las Casas, consisting of 22 houses, disappeared, and a lake of boiling sulphurous water appeared in its place. There had been a slight eruption of the Pic de Genetas in	Ditto; Annual Register, vol. liii. p. 89.

1830. Aug. 31. Saumur in France. Also 7 <sup>h</sup> 58 <sup>m</sup> A.M. felt in Vendée.	Also A severe shock. In Vendée it lasted 3 or 4 seconds.		Accompanied by subterranean noise like that of a heavy-laden carriage in rapid motion. On the same day remarkable meteors were ob- served.	Journ. de l'Empire, 8, 14 et 15 Sept.
— Sept. 1. Inspruck ..... 8 <sup>h</sup> 15 <sup>m</sup> A.M.	A shock, without any oscillation.		Followed soon after by a very loud subterranean noise. It seems however doubtful whether this shock was not the effect of an explosion of gunpowder which took place at Eisenach (at 8 <sup>h</sup> 45 <sup>m</sup> ).	Moniteur, 18 et 19 Sept.
— 7. La Rochelle..... 7 <sup>h</sup> 45 <sup>m</sup> A.M.	A shock from S. to N.			Journ. de l'Empire, 16 Sept.
— 10. Brest ..... 7 A.M.	A severe shock, fol- lowed by another during the night.		Accompanied by a noise like that of a large vehicle.	Ditto, 18 Sept.
— 13. Gross-Kanitscha in Hun- gary. 10 <sup>h</sup> 5 <sup>m</sup> P.M.	Rather violent shock, from N.E. to S.E. (?)			Ditto, 11 Oct.
— Janina in Epirus.....	Second and last earth- quake during the year.			Pouqueville, <i>loc. cit.</i>
— Oct. Be- ginning of the month.	Twenty-six shocks, of which five were very disastrous.			Journ. de l'Empire, 20 Oct.
— 24. Reykiavik and around Mount Hecla, Ice- land.	An earthquake			v. Hoff, Th. 2. S. 388.
— In Norway and in Ger- many.				Ditto.
— Nov. 2. Lisbon ..... 9. Portsmouth (N. Hamp- shire?) in the United States. Also felt at Kennebunk, Portland, Salem, Newburgh- Port, York, Exeter, Dover, Haverhill, and several other towns.	A slight shock At Portsmouth a vio- lent vibratory shock from N.W. to S.E., lasting one or two minutes. At Ken- nebunk there were several shocks du- ring about 20 secs. At Portland but a slight vibration.		At Portsmouth followed by a pretty loud ex- plosion. Windows were broken. At Kenne- bunk also loud detonations were heard, and the houses were violently shaken. At Port- land there was a perfect calm until a moment before the shock, when a violent wind sud- denly rose.	Moniteur, 28 Nov. Ditto, 18 Janv. 1811.
— About 9 <sup>h</sup> 3 <sup>m</sup> P.M. (9 <sup>h</sup> 30 <sup>m</sup> at Portland — probably an error.)				
— 29. At sea, to the south of Cape Matapan, Greece. 11 A.M.	A violent shock, which lasted a minute and a half.			Péroussac, Bull. des Sc. Nat. t. viii. Sept. 1827, p. 51.

1.	2.	3.	4.	5.	6.
Dec. 25. M.	Turin and Parma. Also at Reggio, Verona, Venice, Florence, &c., but not everywhere at the same hour.	At Turin a rather severe shock; at Parma a violent one, followed immediately after by violent oscillations from E. to W., lasting nearly a minute. Some shocks <i>supposed</i> to have been felt.		At Parma a sudden light was observed, followed by an explosion like a loud clap of thunder.	Journ. de l'Empire, 2 et 4 Janv.; Moniteur, 3, 8 et 9 Janv. 1811.
— Int be- en 26 27.	Genoa	Two consecutive shocks from S. to N.		In the midst of a terrible storm	Ditto.
Jan. 1. 0 <sup>m</sup> (A.M. 'M.?)	Tiflis in Georgia	The shocks, which had been but slight since August, were now very violent, especially on the 31st.			Journ. de l'Empire, 21 Avril.
— 28. and 31.	St. Michael's, Azores			On the 31st the town of Ponta Delgada was violently shaken by the earthquake. On the 1st of February a violent submarine eruption commenced at about two miles from the west coast; smoke, ashes, pieces of lava, and other ignited materials were thrown up in a column visible from the coast. The eruption lasted eight days, and produced a bank over which the sea broke. The phenomena recommenced in June following.	Webster and v. Humboldt, <i>loc. cit.</i>
Feb. 1. M.	St. Jean-de-Maurienne	Two slight shocks			Journ. de l'Empire, 18 Fév.; Moniteur, 17 Fév.
— 18.	Rome, Frascati, Tivoli, &c.	A violent shock			Journ. de l'Empire, 5 Mars; Moniteur, 4 Mars.
March.	Etna. A shock on the 27th was felt throughout the whole island.	A great number of slight earthquakes during the month.			Ann. de Chim. et de Phys. <i>loc. cit.</i>
—	Janina in Epirus	An earthquake			Pouqueville, <i>loc. cit.</i>
April 13.	Pigneroi	One shock			Moniteur, 30 Avril.
— 14.	Ditto	Two other shocks, separated by an interval of 12 hours.			Ditto.

1811. May. Island of St. Vincent in the West Indies.	Many shocks. In the Antilles more than two hundred were reckoned from this time up to April 1812.			v. Humboldt, Personal Narrative, vol. iv. p. 36, and Voyages, t. v. pp. 5-14.
— 19. Constantinople	Some shocks from S. to N.		Attended with subterranean noise.	Moniteur, 7 Juillet; Journa. de l'Empire, 8 Juillet.
— 21. Ditto	Ditto		Ditto	Ditto.
— 24. Ditto	Ditto		Ditto	Ditto.
— 29. Rome, Frascati, Tivoli, &c.	A rather violent shock			Journ. de l'Empire, 13 Juin; Moniteur, 14 Juin.
10 P.M. — June 1. Plymouth.		At the hour mentioned, the sea suddenly retired, leaving the shipping dry, and in half an hour after, a wave of 10 or 11 feet in height came in with great violence. This recurred twice, though with diminished violence.	Accompanied by a tremendous noise and violent gusts of wind from the S.W. The mercury in the thermometer (barometer?) rose and fell tremulously during the rushing in of the wave.	Annual Register, 1811, p. 61.
3 A.M.				
— 13. St. Michael's, Azores	Severe and repeated shocks. During the eruption the ground on the island was in a continual state of vibration, varying in intensity with the eruption. The phenomena continued with great violence for four days, but had so much abated on the 4th of July that people were able to land on the volcanic island which had been formed.		The submarine eruption of February now recommenced at two miles and a half further from the coast than before. A mass of rock was detached, by the motion, from the coast of St. Michael's and fell into the sea. For an account of the details of the eruption, which was of great violence, and accompanied by a constant noise like a heavy and well-sustained fire of artillery and musketry, vide the authorities quoted above.	Webster and v. Humboldt, <i>loc. cit.</i>

1.	2.	3.	4.	5.	6.
July 4. In Lapland .....	An earthquake .....	.....	.....	A volcanic eruption on this day from a mountain in the most northern part of Norway. (This is considered doubtful by Keilhan.)	Kefenstein; Moniteur, 9 et 21 Janv. 1812.
— 7. In Norway .....	Ditto .....	.....	.....	The heat for three days before had been suffocating.	Keilhan, <i>loc. cit.</i>
— 15. Genoa .....	A shock of short duration, but rather violent.	.....	.....	.....	Journ. de l'Empire, 27 et 29 Juillet; Moniteur, 28 Juillet.
— 16. Leghorn .....	A severe shock .....	.....	.....	.....	Ditto.
— 29. Verona .....	A slight shock, lasting three seconds. This was the second felt during the preceding month.	.....	.....	.....	Moniteur, 21 Août.
Aug. 1. Reggio in the Duchy of Modena.	A slight one had been felt nearly a month before.	.....	.....	.....	Ditto, 5 Sept.
— 5. In Lapland .....	Another earthquake..	.....	.....	.....	Kefenstein; Moniteur, 9 et 21 Janv. 1812.
— Janina in Epirus .....	One earthquake during the month.	.....	.....	.....	Pouqueville, <i>loc. cit.</i>
Sept. 10. In Lapland .....	Another earthquake..	.....	.....	.....	Kefenstein; Moniteur, 9 et 21 Janv. 1812.
— Janina in Epirus .....	One earthquake during the month.	.....	.....	.....	Pouqueville, <i>loc. cit.</i>
Oct. 4. Vienna. Also felt in Upper Styria and Carinthia.	A shock of three seconds' duration. In Styria and Carinthia two very violent shocks, from S.E. to N.W.	.....	.....	The clocks of the Observatory at Vienna were not stopped. At Kriegbach some chimnies were thrown to the S.E.	Journ. de l'Empire, 18 et 19 Oct.; Moniteur, 17, 20 et 21 Oct.
— Messina .....	Several shocks during the month. The most violent was on the 27th.	.....	.....	Etna was in eruption .....	Journ. de l'Empire, 28 Nov. et 28 Déc.; Moniteur, 27 Déc.
Nov. 17. Muzzuschlag in Styria...	Several shocks, each lasting half a se-	.....	.....	The weather was hazy. No noise was observed.	Moniteur, 7 Déc.

25. In the Grisons, Switzerland. 10. Portsmouth, Gosport, &c. A.M. 12. Marienberg, Annaberg, Elbogen, Saatz, Kadon, &c., on the N.W. frontier of Bohemia.	cond, but less violent than those of the 4th of October. Apparent direction W. to E. Many shocks during this period. Lasted nearly a minute.	Accompanied at Marienberg by a noise like that of some enormous chariot. At Hauenstein, and Saatz, &c., noise like thunder was heard. The barometer at Prague had suddenly, on the 10th, fallen below its mean level. The event is reported on the 13th at Kaden, but doubtless through error.	Ditto, 27 Déc. Annual Register, 1811, p. 135. Gentleman's Magazine, vol. lxxviii. pt. 1. p. 77; Journ. de l'Empire et Moniteur, 28 Déc. 1811, 1 et 7 Janv. 1812.
- 16. Valleys of the Mississippi, Ohio, and Arkansas. Principally in the state of Ohio, but felt also at places in Tennessee, Kentucky, Missouri, Indiana, Virginia, N. S. Carolina, Georgia, and Florida. The shocks were feeble to the east of the Alleghenies than to the west, and were not felt in the swampy region of Louisiana about the mouth of the Mississippi. About New Madrid, in lat. 37° 45', they continued daily, almost hourly, for months, but these	The disturbance of this region now commenced, which lasted until 1813. The shocks began at various places at the Column 1, and recurred at some for two or three days, at others for a long time after. At most of these places, however, there were several shocks during this first night. At Charleston there were six quite distinct. General direction E. to W., not uniform. The	These shocks were accompanied in general by a loud subterranean noise, apparently coming from the S.W. At Nashville some chimneys were thrown down. The atmosphere there was dull and heavy. At Pensacola the houses were heard to crack, and doors and window-shutters seen to move. At Charleston the bells rang. In Missouri ( <i>according to the Indians</i> ) trees were thrown down, and rocks split. At St. Louis a loud subterranean noise like thunder was heard; it seemed to come from the N. or N.W. There was not a breath of wind, and the sky was obscured by a thick fog. The heat was very great for the season. At Vincennes chimneys were cracked. At Cincinnati furniture was displaced, doors opened, and bricks thrown down from the chimnies. At Dalton no sound was heard accompanying the shock. At Zaineville, Springfield, &c., trees and other elevated objects received a distinct undulatory motion. Clocks were stop-	Humboldt, Personal Narrative, vol. iv. p. 36; Relation Historique, t. v. p. 9; Trans. of the Liter. and Philos. Soc. of New York, vol. i. p. 281; Drake, Nat. and Stat. View of Cincinnati, p. 232; Silliman's Journal, vol. i. p. 93; Moniteur, 9 Mars et 14 Oct.; Journ. de l'Empire, 15 Oct. 1812, &c.



1.	2.	3.	4.	5.	6.
<p>ncinnati, 0<sup>m</sup> A.M., than half parafter, 20<sup>m</sup>, and reen 10<sup>m</sup> A.M. At n(Ohio), reen 2<sup>m</sup> 3 A.M. Zainen- , Spring- , and the ghbour- (Ohio), t 3 A.M., 10<sup>m</sup>, 10<sup>h</sup> and 25<sup>m</sup> noon.</p>	<p>long-continued shocks were for the most part very slight.</p>	<p>first was the most violent, and lasted a minute. At St. Louis there were shocks lasting 1½, 2, 1, ½ min., and 50 secs. At Vincennes there were three shocks, followed by a fourth at sunrise, and several others during the day. At Cincinnati the mo- tion seemed to com- mence on the 13th about 11 P.M. The most violent shock, at 2<sup>h</sup> 20<sup>m</sup> A.M. on the 16th, lasted five minutes, according to some, and but two, according to others. The others felt here were of shorter duration, and feebler. At Dal- ton the motion was almost continuous for two days. At Zainenville, Spring- field, &amp;c., where the direction N.E. to S.W., there were several shocks next day.</p>		<p>ped at these places. The air was quite calm, and no noise was heard. During these shocks great clefts opened in the ground, from which quantities of water, sand, and pieces of coal were thrown out. Large lakes were formed in many places. The level of the ground was permanently raised and depressed in various localities, and a bar thrown up across the Mississippi. Trees were <i>seen</i> to bend before the shocks, and were often locked together so that their branches were torn and broken. For further details see the authorities quoted.</p>	
<p>Dec. 18, Verona.....</p>	<p>.....</p>	<p>.....</p>	<p>.....</p>	<p>A thick fog prevailed at the time, but soon after.</p>	<p>Journ. de l'Empire, 3 Janv.; Moni- tor, 4 Janv. 1819</p>



<p>n. 6. In the valley of the Mississippi, especially at New Madrid. It extended 200 miles from this place (in every direction?).</p>	<p>terrible earthquake of March 26 following. A violent earthquake. The ground had been constantly agitated, as mentioned above, for a month before, and continued so until the date of the Caracas earthquake.</p>	<p>.....</p>	<p>p. 5.</p>
<p>- 17. In the province of Södermanland, Sweden.</p>	<p>Two shocks. The first was rather feeble, and was followed, after an interval of a minute, by the second, of greater violence and lasting 15 seconds. (Five or six undulations were counted per second.)</p>	<p>.....</p>	<p>Silliman's Journal, vol. iii. p. 20; Iluot, Géologie, t. i. p. 114.</p>
<p>- 18. In Oxfordshire</p>	<p>Trembling lasting ten minutes.</p>	<p>.....</p>	<p>.....</p>
<p>- 23. New Orleans, and still more at Pensacola.</p>	<p>A slight vibration which lasted but a few seconds.</p>	<p>.....</p>	<p>Gentleman's Magazine, vol. lxxiii. pt. 1. p. 80.</p>
<p>- 26. Genoa</p>	<p>A shock of 2 or 3 seconds' duration.</p>	<p>.....</p>	<p>.....</p>
<p>- 27. Ditto</p>	<p>A second shock, of greater violence but shorter duration.</p>	<p>.....</p>	<p>.....</p>
<p>- Janina in Epirus</p>	<p>One earthquake during the month.</p>	<p>.....</p>	<p>.....</p>
<p>1. At the salt-works of Ischl, in the neighbourhood of Linz.</p>	<p>A rather severe shock.</p>	<p>.....</p>	<p>.....</p>
<p>.....</p>	<p>A building was cracked by the shock</p>	<p>.....</p>	<p>.....</p>

1.	2.	3.	4.	5.	6.
Feb. 3. Macerata in the States of the Church.	tion of the N.W. (from S.E.), with a perceptible oscillation for 3 or 4 secs.				Moniteur, 29 Fév.; Journ. de l'Empire, 1 Mars.
— 4. Ditto	Perceptible shocks				Ditto.
— 7. New Orleans, and still more at Fort St. Philip.	A slight oscillatory motion like that of a ship when getting under weigh. It recurred twice or thrice in two minutes. During this day and the following there was continual oscillation in the basin of the Mississippi.			The year before these repeated shocks on the Mississippi, it had been remarked that Louisiana was almost quite exempt from storms.	Moniteur, 29 Fév.; Journ. de l'Empire, 1 Mars.
— 9. East Haddam, Connecticut.	Two of the slight rumblings so often felt or heard here.			The weather was clear	Silliman's Journal, vol. xxix. p. 339.
— 11. Macerata in the States of the Church, and at San-Severino.	Two shocks, more severe at San-Severino than at Macerata.				Moniteur, 29 Fév.; Journ. de l'Empire, 1 Mars.
— 14. Mirabel in the department of Drôme.	Another shock				Journ. de l'Empire, 25 Mars.
— 15. Ditto	Another, the most violent of the three.				Ditto.
— 19. In the Brettigan (Gri. sons).	Several shocks				Ditto.
Mar. 19. Beaumont, Vacluse. At Beaumont several shocks. At Avignon, Apt, and the	At Beaumont several shocks. At Mar-				Moniteur, 23 Mars; M. Studer's Catalogue.
				Much damage was done to buildings, for the repair of which Napoleon gave 12,000 francs by	Journ. de l'Empire, 4 Août; Statistique des Bouches-du-Rhône;

Midnight.	The village of Beaumont seems to have been the centre of disturbance. Also at Marseilles.	the motion continued until April, or according to M. Guérin, until May 30, another shock of note occurring on the 26th March, the day of the Caracas earthquake.	.....	Accompanied by a noise like thunder. The atmosphere was calm, and cloudy. Considerable damage was done.	The <i>Moniteur</i> , 5 Avril; <i>Journ. de l'Empire</i> , 6, 7 et 8 Avril; <i>Gentleman's Magazine</i> , vol. lxxiii. pt. 1. p. 475.
1812 Mar. 22. About 3 A.M.	Rome .....	An undulatory shock, the most severe felt for some time, from W. to E., not from N. to S., as was at first stated. Lasted twenty-five seconds. There had been a slight oscillatory movement at 11 <sup>h</sup> 30 <sup>m</sup> P.M. on the 21st, and a similar one followed at 4 A.M. on the 22nd.	.....		
— 26. 4 <sup>h</sup> 7 <sup>m</sup> P.M.	Caracas, and the surrounding country. The earthquake extended over the provinces of Venezuela, Varinas, Maracaibo, and particularly in the high mountains of Merida, in New Grenada, and as far as Carthagena in the Andes; on a line from E.N.E. to W.S.W.	Felt on board ships in the port of La Guayra as if they had been on the rocks.	.....	Accompanied by a noise louder than thunder. Caracas was utterly ruined by this terrible earthquake. The earth at that place appeared like the surface of a boiling liquid. At Valencia an immense torrent of water burst forth, and the lake of Maracaibo was lowered. Large masses of rock were detached and hurled down from the mountains. The sky was clear, and the night calm and beautiful. The preceding day had been extremely hot. Not a drop of rain had fallen for five months.	v. Humboldt, <i>Voyages</i> , liv. v. ch. 14. et t. v. p. 295; <i>Annual Register</i> , 1812, p. 39; <i>Moniteur</i> , 25, 30 Mai, 4, 30 Juin, 2 Juillet, 8 Août, 28 Sept.; <i>Journ. de l'Empire</i> , 24 Mai, 3 et 9 Juin; <i>Ann. de Chim. et de Phys.</i> t. lxi. p. 189, t. lviii. p. 83.



DATE.	LOCALITY.	CHARACTER OF SHOCKS.	PHENOMENA.	REMARKS.
— 17. — 4 A.M.	Kandern and Mulheim in the Upper Brisgau.	A shock apparently from E. to W.	Accompanied by subterranean noise. A chimney was thrown down.	Journ. de l'Empire, 4 Août; Moniteur, 1 et 11 Août.
— 23. — 8 <sup>h</sup> 45 <sup>m</sup> A.M.	Pignerol	A rather severe shock.	Preceded by an explosion like a distant clap of thunder.	Journ. de l'Empire, 4 Août.
— 26. — About 9 P.M.	Waradin, Impensnitz, and Agram, in Croatia.	A single shock		Moniteur, 1 Sept.
— 27. — 2 A.M.	Waradin	Another, more severe.	Accompanied by thunder and wind. Some walls were broken.	Ditto.
— Aug. 22. — About 3 <sup>h</sup> 30 <sup>m</sup> A.M.	Bex, and Aigle, in the Canton du Vaud.	Lasted two or three seconds.		Moniteur, 11 Sept.; Journ. de l'Empire, 12 Sept.
— Sept. 11. —	Florence and its environs.	Several shocks during the day and following night. They were frequent until the 14th.	Several houses were injured	Moniteur, 23 Sept.; Journ. de l'Empire, 25 Sept. et 1 Oct.; Annual Register, 1812, p. 114.
— — — About the middle of the month.	In the island of Ischia.	A slight shock.	The weather was very variable at Naples	Moniteur, 19 Oct.
— Aug. 25. — 7 <sup>h</sup> 55 <sup>m</sup> A.M.	In Bavaria and the Tyrol, extending to Treviso in Lombardy. A very large district was shaken.	At Inspruck the shock lasted nearly a minute. At Treviso the direction was to the S. and N.W. At Treviso the duration of the shock four or five seconds (or, according to the Moniteur, 4 or 5 minutes). In other places two shocks were felt.	At Rohendorf a bell was caused to toll. At Trento a mountain was cleft, and part fell on the following day. At Treviso several houses were violently shaken.	Moniteur, 8, 11, 16, 18, 21 et 26 Nov.; Journ. de l'Empire, 10, 16, 17 et 25 Nov.
Nov. — Night 3 & 4. — between 11. — 9 or 10 mins. before	At Nuremberg	Several shocks.		Moniteur, 18 Nov.
	Kingston in Jamaica	A shock of forty seconds' duration.	Almost all the houses were injured	Ditto, 26 Janv. 1813.



— 17. — 4 A.M.	Kandern and Mulheim in the Upper Brisgau. Pignèrol	at this place. A shock apparently from E. to W. A rather severe shock.	Accompanied by subterranean noise. A chimney was thrown down. Preceded by an explosion like a distant clap of thunder.	Journ. de l'Empire, 4 Août; Moni- teur, 1 et 11 Août. Journ. de l'Empire, 4 Août.
8 <sup>h</sup> 45 <sup>m</sup> A.M.	Waradin, Impenschtz, and Agram, in Croatia.	A single shock		Moniteur, 1 Sept.
About 9 P.M.	Waradin	Another, more severe.	Accompanied by thunder and wind. Some walls were broken.	Ditto.
2 A.M.	Bex, and Aigle, in the Canton du Vaud.	Lasted two or three seconds.		Moniteur, 11 Sept.; Journ. de l'Em- pire, 12 Sept.
Aug. 22. About 3 <sup>h</sup> 30 <sup>m</sup> A.M.	Florence and its envi- rons.	Several shocks during the day and following night. They were fre- quent until the 14th.	Several houses were injured	Moniteur, 23 Sept.; Journ. de l'Em- pire, 25 Sept. et 1 Oct.; Annual Register, 1812, p. 114.
Sept. 11.	In the island of Ischia...	A slight shock.	The weather was very variable at Naples	Moniteur, 19 Oct.
About the middle of the month. Oct. 25. 7 <sup>h</sup> 55 <sup>m</sup> A.M.	In Bavaria and the Tyrol, extending to Treviso in Lombardy. A very large district was shaken.	At Inspruck the shock lasted nearly a mi- nute. At Trente the direction was to the S. and N.W. At Treviso the dura- tion of the shock four or five seconds (or, according to the Moniteur, 4 or 5 minutes). In other places two shocks were felt.	At Rohendorf a bell was caused to toll. At Trente a mountain was cleft, and part fell on the fol- lowing day. At Treviso several houses were violently shaken.	Moniteur, 8, 11, 16, 18, 21 et 26 Nov.; Journ. de l'Empire, 10, 16, 17 et 25 Nov.
Nov. be- Night 3 & 4. tween 11. 9 or 10 min- utes.	At Nuremberg Kingston in Jamaica	Several shocks. A shock of forty se- conds' duration.		Moniteur, 18 Nov. Ditto, 26 Janv. 1813.



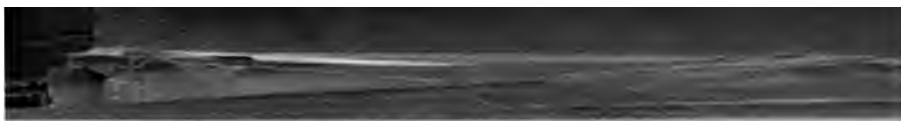
1.	2.	3.	4.	5.	6.
Nov. 12.	Jamaica .....	Three shocks together lasting 30 secs.	The sea was much agitated.	Probably the same as the last account .....	Gentleman's Magazine, vol. lxxxiii. pt. 1. p. 80.
— 18. 3 <sup>rd</sup> A.M.	Bonn on the Rhine .....	A shock lasting two or three seconds.			Journ. de l'Empire, 25 Nov. et 1 Déc.; Moniteur, 28 Nov.
— 1 <sup>st</sup> A.M.	In the neighbourhood of the Siebengebirge, close to Bonn.	Two shocks .....		Some persons on horseback were thrown .....	Ditto.
Dec. 3.	Foggia, in the kingdom of Naples.	A rather severe shock.			Journ. de l'Empire, 24 Déc.
— 10 <sup>th</sup> P.M.	of Naples.				Ditto, 16 Janv. 1813.
— 13.	Oberhalbstein in the Grisons.	A slight shock.			Ditto.
4.	Ditto .....	Ditto .....			
4.	During Portsmouth .....	A violent shock .....			Philos. Magazine, 1825, Jan. p. 70.; Ferrussac, Bull. des Sc. Nat. t. vi. p. 186.
Jan. 16.	In Sicily .....	Two vibrations .....		Accompanied by a strong smell of <i>ammonia</i> ; during a sudden squall.	Ann. de Chim. et de Phys. loc. cit.
Feb.	Bucharest in Wallachia.	Three rather severe shocks. The motion was horizontal, from N.W. to S.E.		Accompanied by loud subterranean noise. Walls were cracked.	Walls Journ. de l'Empire, 13 Mars.
Mar. 7.	Macerata in the States of the Church.	A shock lasting four seconds.			Moniteur, 29 Mars; Journ. de l'Empire, 31 Mars.
April 1.	Ancona .....	Slight shocks daily during this period.			Journ. de l'Empire, 3 Mai; Moniteur, 4 Mai.
—	Janina .....	Earthquakes on two days during the month.			Pouqueville in Ann. de Chim. et de Phys. t. xlv. p. 408.
May 5.	Presburg in Hungary .....	Two slight shocks at the hours mentioned.			Journ. de l'Empire, 26 Mai; Moniteur, 27 Mai.
—	Janina .....	One earthquake during the month.			Pouqueville, loc. cit.
June 3.	Eödenburg in Hungary.	Two rather severe shocks.		During a slight storm .....	Journ. de l'Empire, 16 Juin; Moniteur, 17 Juin.

Date and time	Place and the surrounding district.	Description of the earthquake.	Phenomena observed.	Remarks.
1813, June 19, 9 <sup>h</sup> 30 <sup>m</sup> A.M.	Naples	A slight shock	A number of strange things were thrown up from the sea-bottom on the shore, amongst others the bones of an enormous whale.	Less perceptible on hills than in the plain
July 18, 5 <sup>h</sup> 10 <sup>m</sup> P.M.	Rosa in Catalonia, Spain	A violent earthquake.		A rumbling noise proceeded from the interior of the earth. Preceded by a terrible storm.
— 28, —	Kingston, Jamaica	A violent shock of earthquake, but of short duration.		Accompanying a dreadful tempest, which began by heavy rain.
— — —	Janina	Earthquake shocks on nine days during the month.		Pouqueville, <i>loc. cit.</i>
— Aug. 7, —	Watsborg in Carinthia.	At Watsborg several shocks, lasting eight or ten seconds. Direction N.W. to S.E. At Laybach three shocks, one of which lasted more than 3 secs. The motion was oscillatory at Brunsee.		Moniteur, 21 Août, 1 et 8 Sept.; Journ. de l'Empire, 21 Août et 23 Sept.
At Watsborg 0 <sup>h</sup> 45 <sup>m</sup> A.M.	Also felt at Laybach and in Styria.			
At Laybach 1 A.M.				
— 22, —	Irkutsk	Two shocks, together lasting 40 seconds.		Mém. de l'Acad. Imp. de St. Pétersbourg, t. vi. p. 48.
— — —	Janina	Shocks on four days during the month.		Pouqueville, <i>loc. cit.</i>
— 6, —	Buda, Pesth, and at Stuhlweissenburg.	A very perceptible shock.		Moniteur, 8 et 10 Oct.; Journ. de l'Empire, 10 Oct.
Sept. 9 <sup>h</sup> 33 <sup>m</sup> A.M.	Marceilles	Vibratory		Statistique des Bouches-du-Rhône.
— 10 <sup>h</sup> 30 <sup>m</sup> A.M.	Teneriffe	Three shocks, of which the first and principal lasted three-quarters of a minute.	The shock was quite perceptible on board the vessels near the island.	Annual Register, 1813, p. 81; Trenchard's Magazine, vol. xlii. p. 316.
— 11 <sup>h</sup> 30 <sup>m</sup> A.M.				

1.	2.	3.	4.	5.	6.
1813 Sept. 21. 8 <sup>h</sup> 40 <sup>m</sup> A.M.	Imola in the States of the Church.	A strong shock from N.W. to S.E., accompanied by undulatory motion for 10 or 12 seconds.		Buildings were much injured.	Journ. de l'Empire, 5 et 11 Oct.; Moniteur, 12 Oct.
1 <sup>h</sup> 45 <sup>m</sup> P.M.	Forli	Other slight shocks.			Ditto.
3 P.M.	Ditto			The sun appeared with a pale colour. These shocks did much damage at Faenza.	Ditto.
22. 1 <sup>h</sup> 45 <sup>m</sup> A.M.	Rundess, Marinsbruck, and in the Lower Engadine, Grisons.	Two successive slight shocks.		During thunder and rain	Moniteur et Journ. de l'Empire, 21 et 22 Oct.
3 <sup>h</sup> 30 <sup>m</sup> A.M.	The whole valley of Coire, Grisons.	An earthquake.			Ditto.
24. In the evening.	Stamford, Peterborough, &c. Janina	Lasted two seconds. Earthquakes on three days during the month.			Gentleman's Magazine, vol. lxxxiii. pt. 2. p. 391. Pouqueville, <i>loc. cit.</i>
Oct. 6. 9 <sup>h</sup> 45 <sup>m</sup> and 10 <sup>h</sup> 2 <sup>m</sup> A.M.	Forli in the Romagna	Two more slight shocks at the hours mentioned.			Journ. de l'Empire, 19 et 28 Oct. et 5 Nov.
8. In the morning.	Ditto	Another shock			Ditto.
9. 10 A.M. and 11 P.M.	Ditto	Two more shocks			Ditto.
16 and 17. Night between 16 and 17.	Ditto	Four more shocks. The first was violent and rather long. Two more shocks. One earthquake during the month.			Ditto.
Dec. 25. 1 A.M.	Pisa	A severe shock		Three blows were struck on the bell of a public Communication of Signor Pilla to M. Perrey.	Pouqueville, <i>loc. cit.</i>
28.	East Haddam, Connecticut.	The last of the slight		The weather was wet.	Silliman's Journal, vol. xxix. p. 11.

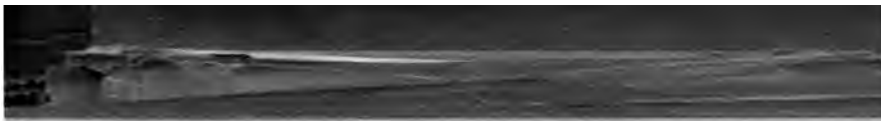


	2.	3.	4.	5.	6.
Apr. 28. Inspruck ..... 9 <sup>th</sup> A.M.	Two severe shocks from W. to E.				Journ. des Débats, 12 Mai.
May 7. Pesth and Ofen in Hun- gary.	Several shocks				Moniteur, 1 Juin.
— 10. Ditto ..... — Tagaurug on the Sea of An Azov.	Ditto An earthquake				Ditto. Dubois de Montpéroux, <i>loc. cit.</i> t. v. p. 32; Eyriès, <i>Nouv. Ann. des Voyages</i> , t. xxix. p. 109; D'An- buisson, <i>Traité de Géog.</i> t. i. p. 427.
— 22. Marmande, Alquillon, A shock from E. to W., 1 <sup>st</sup> A.M. and Clairac, in the de- partm. Lot et Garonne.	A long and violent shock.				Moniteur, 7 Juin.
— 0 <sup>th</sup> A.M. Oléron, and as far as A Jacca in Spain.	A slight earthquake.				Ditto, et 9 Juin; Tilloch's Magazine, vol. xliii. p. 463; Palassou, <i>loc. cit.</i>
— June ... In Jamaica ..... — Janina ..... — Sept. 1. At the parsonage of Salt- dalén in Sweden, and the neighbourhood.	One earthquake du- ring the month. An earthquake of greater violence than the one of August 31, 1819.				Moniteur, 19 Juillet. Pouqueville, <i>loc. cit.</i>
— 2. Ditto ..... — Near Alais in the de- partm. Gard:	Two slighter shocks. No actual shock men- tioned. Perhaps not an earthquake.				Rigstinden for 1819, No. 83; Kellhan.
Before Cornon in Hungary ... 21.	Several earthquake shocks during the year.				Ditto. Journ. des Débats, 24 Sept.
Oct. 9. Kingston in Jamaica, A violent vibratory minutes and its neighbourhood. P.M.	A violent vibratory shock.				Moniteur, 21 Sept. Ditto, 11 Déc.



v. 3. In Sicily, in the neighbourhood of a mountain named Zonolario, and of the Tempa-della Basile.	.....	.....	.....	A sudden eruption of ashes took place on this day from a part of the mountain mentioned. The phenomenon was not preceded by any noise, but was followed by an earthquake (perhaps not on the same day (?)).	Ann. de Chim. et de Phys. t. xxi. p. 400.
- 6. At Lyons, and along the whole line from Mâcon to Vienne.	.....	Two severe shocks from W. to E.	.....	Preceded by a loud explosion without any lightning. Much rain fell before and after the shocks. Some houses were thrown down, and boats were dashed against one another.	Journ. des Débats, 14 Nov.
- Janina .....	.....	Shocks on three days during the month.	.....	.....	Pouqueville, loc. cit.
..... Troitsko-Savka and Kischta in Siberia.	.....	An earthquake similar to that of 1829, but less severe than that of 1792.	.....	.....	Férussac, Bull. des Sciences Nat., t. xxi. p. 60.
n. Janina .....	.....	Shocks on one day of this month.	.....	.....	Pouqueville, loc. cit.
il 9. Agen and in the departm. Lot-et-Garonne.	.....	Several shocks.	.....	.....	Journ. des Débats, 23 Avril.
- Toulouse .....	.....	One shock	.....	During this month an eruption of the greatest violence took place in the island of Sumbawa, in the Eastern Archipelago. The effects were terrible, and extended more or less over the whole of the Moluccas and neighbouring islands.	D'Aubuisson, Géologie, t. i. p. 200.
re Janina .....	.....	One earthquake during the month.	.....	.....	Pouqueville, loc. cit.
- Iceland, especially in the northern part, in the district of Æsafus.	.....	Ditto	.....	Earthquakes are said to be of frequent occurrence in the district of Æsafus.	Eyriæ, Abrégé des Voyages Modernes, t. vii. p. 173; Voyage en Islande.
ily 8. In the neighbourhood of Mt. Stati, one of the mountains separating Lombardy and Germany.	.....	Two or three shocks.	.....	Accompanied by a little hail and a north-east wind. Snow fell during the following night.	Bibl. Brit. t. lx. p. 391. (partie "Sciences et Arts").
ing of Naples .....	.....	A severe shock	.....	.....	Moniteur, 31 Août.
ing of Naples .....	.....	An earthquake	.....	.....	Ann. de Chim. et de Phys. loc. cit.
ing of Naples .....	.....	Some slight shocks in the direction S.E. (to N.N.W.?).	.....	.....	Moniteur, 9 Oct.

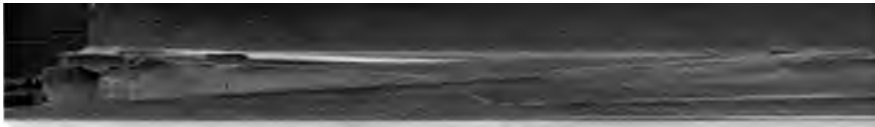
1.	2.	3.	4.	5.	6.
Sept. ...	Janina .....	One earthquake during the month.			Ponqueville, <i>loc. cit.</i>
Oct. ...	Ditto .....	Ditto .....			Ditto.
Nov. ...	Ditto .....	Shocks on two days during this month.			Ditto.
Dec. ...	Ditto .....	One day of this month.			Ditto.
Feb. 2. 0 <sup>m</sup> A.M.	Lisbon, and to the distance of 300 leagues to the west. Also felt in Madeira and in Holland.	At Lisbon a severe shock which lasted nearly a whole minute, or, according to others, 1½ or 3 minutes. The oscillations appeared to be from N.E. to S.W., and were followed by others of shorter duration at 6 <sup>h</sup> 45 <sup>m</sup> A.M.	Felt on board a ship 270 leagues W.S.W. from Lisbon (in 34° 15' N. lat. and 15° 16' W. long. from Lisbon). The first shock was at 0 <sup>h</sup> 46 <sup>m</sup> A.M. (Lisbon time), and produced the impression that the ship had touched the bottom, the grating motion lasting more than two minutes. A second, of much less intensity, was felt at 6 A.M. (Lisbon time). On board another vessel, 120 leagues to the W.S.W. of Lisbon, strong shocks were felt at 0 <sup>h</sup> 42 <sup>m</sup> , lasting five or six minutes, at 3 <sup>h</sup> 40 <sup>m</sup> , for but two or three seconds, and at 5 <sup>h</sup> 57 <sup>m</sup> (all Lisbon time), for three minutes. Also felt on board an American ship between Madeira and the Azores.	At Lisbon the people quitted their houses. There had been a storm the day before, after which the weather was remarkably calm and sultry until the shock, which was succeeded by heavy rain. A meteor appeared immediately after the first shock. Flocks of birds filled the air, uttering the most discordant cries. The Annual Register gives 0 <sup>h</sup> 55 <sup>m</sup> and 7 <sup>h</sup> A.M. as the hours at Lisbon.	Garnier, <i>Météorol.</i> p. 116; Ann. de Chim. et de Phys. t. xi. p. 323; Journ. des Débats, 27 Fév. 3 et 10 Mars; Moniteur, 10 Mars; Annual Register, 1816, p. 22; Trenchard's Magazine, vol. lxvii. p. 148.



b. 7. At St. Gall in Switzer-land.	A vibratory shock			M. Studer's Catalogue.
1. Åsterund in Sweden.	.....	.....	.....	v. Hoff, Th. 2.
17. Sheffield, Nottingham, Doncaster, Lincoln, Derby, &c.	Lasted from 1½ to 2 minutes. Appeared to move from W. to E. at Lincoln, and from N. to S. at Derby.		Accompanied by a noise like that of a rising tempest. Pictures, lustres, and bells were set in motion, and the body of a mangle was moved some feet upon its rollers.	Annual Register, 1816, p. 44; Moniteur, 1 Avril.
-29. In the bailiwick of Mink-syk, in the country of the Don Cossacks.	Violent shocks.			Moniteur, 29 Juin.
il. Island of Poulo-Penang	Shocks lasting a long time.	Felt on board vessels at sea, more than 30 leagues from the island.		Garnier, Météorol. p. 117.
Mon- the A.M. y 15.				M. Studer's Catalogue.
ly 2. Boltigen in the Simmen-thal (Canton of Berne).				Ditto.
- 5. Ditto	Several people be-lieved that they felt an earthquake.			Ditto.
- ... Yverdon in the Canton du Vaud.			From the 27th to the 31st the water of the lake of Neuchâtel rose two French inches.	Journ. des Débats, 10 Août.
5. 7. Mount Vesuvius	A violent shock		Followed by an eruption	Ditto, 3 Sept.; Moniteur, 4 Sept.
-13. Inverness and the coun-try for 100 miles round, including Aber-deen, Perth and other places in the north of Scotland; the centre of disturbance being apparently in Inver-ness-shire.	N.W. to S.E., lasting from 3 secs. to 1 min. at different places. Followed by another and very slight shock after an interval of half-an-hour.		There had been very fine serene weather before the earthquake, but it was followed by con-tinuous and heavy rain. The spire of the church at Inverness was greatly shaken, and five or six feet of the top of it was twisted round, so that the angles of the octagon (the form of section of the spire) coincided with the middle of the faces of the part below. Doors which were open swung backwards and forwards on their hinges several times. Bells weighing several tons, was thrown up twelve inches, and stones rolling under it kept it so until almost all the water had escaped. The water of Loch Leven and some streams flow-	Annals of Philosophy, vol.viii. p.368; Tilloch's Magazine, vol.xlviii. p.150.



2.	3.	4.	5.	6.
Sept. 7. Frascati in the States of the Church.	A slight shock.		ing from it was rendered unusually muddy. Many people experienced a slight faintness and sickness. Dogs howled, and the birds were scared from their roosting places.	Moniteur, 27 Sept.
— 9. Montreal in Canada.	A severe shock			Journ. des Débats, 1 Janv. 1817.
— 16. Ditto	A second shock, of less violence than the former, lasted 30 seconds.			Ditto.
Oct. 27. In Galicia, Spain.	A slight shock, the third felt during the year.			Ditto, 28 Nov.
Nov. 1. Sciacca in Sicily.	Several shocks.		Accompanied by subterranean noise	Férussac, Bull. des Sci. Nat. t. iv. p. 8.
— 1. In the district of Grandson, Canton du Vaud.	Two shocks. The second was very violent, especially in the hamlet of Corcelletes.		The second shock was accompanied at the hamlet of Corcelletes by a loud subterranean noise.	Bibl. Univ. de Genève, t. iv. Mars 1817, p. 244.
— On the island of Pantellaria, and in Sicily.	Shocks from S.W. to N.E., and therefore in the line of the volcanos of this region.			Audot, Roy. de Naples, p. 321.
Jan. 13. Somewhere in the Gulf Stream (!).				Tilloch's Magazine, vol. xlix. p. 385.
— 15. At Payerne and several villages of the Canton du Vaud.	A violent shock			Journ. des Débats, 25 Janv. et 27 Mars.
— 17. Ourches in the valley of Chamouni.	One shock			Ditto; Tilloch's Magazine, vol. xlix. p. 385.
— 19. Ditto	Ditto			Ditto.
— 20. Ditto	Ditto			Ditto.
— Alcover in Spain.				Tilloch's Magazine, loc. cit.
— 23. Lámoges and Gueret	A slight shock.			Journ. des Débats, 6 Fév.



1. 27. Mansfield in Nottinghamshire, and the surrounding villages.				Gentleman's Magazine, vol. lxxxvii. pt. 1. p. 268.
28. Macao in China, and the country around.	Two shocks			Asiatic Journal, vol. iv. p. 302; Garnier, <i>Météorol.</i> p. 118.
2. Island of Madeira	A violent shock	Felt also at sea, on board vessels more than 200 leagues from the island.		Ann. de Chim. et de Phys. t. xxx. p. 411; Garnier, <i>Météorol.</i> p. 118.
5. Macao in China, and the country round.	Several slight shocks.			Asiatic Journal, vol. iv. p. 302.
11. Bâle in Switzerland	An earthquake			Mérian.
In the valley of Chamouni, and at St. Gervais.	Another shock			Tilloch's Magazine, <i>loc. cit.</i>
13. Ditto	Ditto			Ditto.
14. Ditto	Ditto			Ditto.
11. Lyons	Ditto			Ditto.
Ouches in the valley of Chamouni, and at St. Gervais.	Another violent shock, from S.W. to N.E., followed by eleven more shocks before dawn.			Accompanied by a loud detonation. Furniture was thrown down, and arches were broken.
Lausanne, throughout the canton, and at Berne, Neuchâtel and Geneva. Also felt at Yverdon, at Thun and other places in the Emmenthal as far as Wynigen.	Several shocks during the space of a min. At Berne the motion occurred (at 9 o'clock) and was but feeble.			The glaciers cracked, and at the same instant lightning was observed over Mont Blanc, and a sort of light on the opposite side of the valley. The sky was serene. In several places, especially at Geneva, articles of furniture were displaced, and doors opened. Almost everywhere, birds asleep in cages were thrown off their perches. At Yverdon a picture strongly hung was thrown on the floor. In another house a plaster ceiling, nearly new, was cracked in several places. Some hours later the western part of the chalet of Liebig near Aran fell, burying an old servant beneath the ruins. A sort of cracking noise was heard in many walls, which lasted after the shock had passed. Twenty-four hours before, a dull rumbling noise had been remarked, like a detonation at a great depth in the earth. From the 1st to the 8th of March the wind had been very violent in Switzerland, and on the 7th and 8th there were avalanches.

1.	2.	3.	4.	5.	6.
1875, Mar. 13. 7 A.M.	Onches in the valley of Chamouni.	Another shock			Journ. des Débats, 22 et 27 Mars, 5 et 17 Avril; M. Studer's Catalogue.
10 <sup>h</sup> 50 <sup>m</sup> A.M.	Ditto	Ditto			Ditto.
11 A.M.	Ditto	Ditto			Ditto.
At noon.	Ditto	Ditto			Ditto.
2 <sup>h</sup> 10 <sup>m</sup> P.M.	Ditto	Ditto			Ditto.
11 <sup>h</sup> 20 <sup>m</sup> P.M.	Ditto	Ditto			Ditto.
5 <sup>h</sup> 50 <sup>m</sup> P.M.	11. Messina	A very violent shock		Accompanied by a tremendous noise	Moniteur, 11 Avril.
—	13. Onches in the valley of Chamouni.	Another shock			Journ. des Débats, <i>loc. cit.</i> ; Studer; Tilloch's Magazine, <i>loc. cit.</i>
10 <sup>h</sup> 15 <sup>m</sup> A.M.	18. In the part of Spain comprised between the two seas and the Pyrenees, from Santander to Taragona; and in the region between Palencia, Toledo, and the mountains of Cuenca. Most violent in the Rioja, between Logrono, the right bank of the Ebro; and the frontier of Navarre. In other parts of the Rioja, in Castille, Biscay, Arragon and Catalonia, the earthquake was but slight. Also felt at Lerida, Cervera, Cienfuegos, &c.	A very severe shock. At Madrid, however, it was felt but slightly, as also at Santander, Palencia and Saragoza, and still less at Cuenca and Barcelona (where some people said that it took place half an hour later than the time here given). In Navarre, at Pampluna, and Albaracin it was rather severe. The shock seemed to come from the west. Throughout the Rioja it recurred twice with an interval of a quarter	The sky had been clear and serene until 10 <sup>h</sup> 30 <sup>m</sup> , but then became overcast; the sun disappeared, and a terrible obscurity began, with a cold and impetuous wind from the N.W., lasting until the shock took place. The latter was accompanied by rumbling subterranean noise. The buildings were much shaken, and chimneys, walls, and even some houses were thrown down. At Arnedo, Prejano, Arnedillo, Calahorra and Aurejo much damage was done. At Logrono everyone was thrown down. At Albaracin abundant hail followed the shock. The weather in Spain had been very variable for some months. A cold summer succeeded a winter so mild that the temperature was constantly 5 or 6 degrees above that of ordinary years, and in some places there had been a great drought for three months.		Moniteur, 14, 17 et 25 Avril; Journ. des Débats, 6, 7, 11 et 13 Avril; Ann. de Chim. et de Phys. t. lrv. p. 396; Tilloch's Magazine, <i>loc. cit.</i>

1817, Mar. 18. 11 <sup>h</sup> 30 <sup>m</sup> A.M.	Throughout the district of the Rioux only.	of an hour, but not elsewhere.	Another shock			Ditto.
3 P.M.	Ditto		Ditto			Ditto.
11 P.M.	Ditto. On this same day oscillatory motion was observed at Pau, Ogenne, Dognen, Vielleseure, Oloron, and Bayonne, to the north of the Pyrenees.	Ditto. Followed by others, up to the 27 <sup>th</sup> . M. Gutierrez says that there were 116 shocks in three months about this time.				Ditto.
11 or 11 <sup>h</sup> 15 <sup>m</sup> P.M.	At most of the places shaken on the 18 <sup>th</sup> .	According to some this shock was more violent; according to others, less so than that of the 18 <sup>th</sup> .				Ditto.
Night between 25 and 26.	Frascati, Genzano, and some other places in Italy.	Two shocks; the first of which was very slight, and the second very violent.				Journ. des Débats, 15 Avril; Tilloch's Magazine, <i>loc. cit.</i>
— 26. Ditto		Perhaps this account refers only to the second of the two shocks last mentioned.				Tilloch's Magazine, <i>loc. cit.</i>
— 28. Ouches in the valley of Chamouni.		An earthquake.	Another shock	Accompanied by subterranean noise		Ditto; Journ. des Débats, 5 et 17 Avril.
30. Ditto		Ditto	Ditto	Ditto		Ditto.
31. Ditto		Ditto, very violent	Ditto	Ditto		Ditto.
April 1. Ditto		Another	Ditto	Ditto		Ditto.
2. Ditto		Very violent; from N. to S. (or S. to N.?)	Ditto	Ditto		Ditto.
15. In Sicily		An earthquake.		Some damage was done		Péroussac, Bull. des Sci. Nat. t. iv. p. 9.
16. Appenzel in the canton of same name.		A severe shock		There had been a terrible storm the day before.		Journ. des Débats, 28 Avril; Studer.
2 <sup>h</sup> 30 <sup>m</sup> A.M.	At Naples, and about the same period at Palermo.	Several shocks of considerable severity.		At Palermo strange howling noises were heard in the air, and large spots were observed on the sea. A very great eruption of Etna was the cause of the shocks at both places.		Moniteur, 17 Mai; Journ. des Débats, 16 et 21 Mai.

1.	2.	3.	4.	5.	6.
April....	A place named Chang-Ruh, on the borders of the province of Szechuen, on the western frontier of China.	A violent earthquake.		Above 11,000 houses were thrown down, and more than 2800 persons killed.	Quart. Journ. of Roy. Inst. vol. vii. p. 191, quoting a Pekin Gazette of May 2.
May ....	Several places in Sicily.	Several shocks.			Moniteur, 16 Juin.
June 10.	Urquhart, Dore, and near Inverness.	A smart shock.			D. Milne on Earthquake Shocks felt in Great Britain; Edinburgh New Philosophical Journal, vol. xxxi. p. 118.
— 16.	Ditto .....	Two, similar to the last.			Ditto.
M. — 30.	Inverness and neighbourhood.	Two very violent shocks.			Tilloch's Magazine, vol. li. p. 193.
July 7.	Schaffhausen, and at same hour at Porrentruy in the canton of Berne.	At Schaffhausen a rather severe shock, which was more violent a league from the town. At Porrentruy also the motion was stronger in the environs.			Moniteur, 30 Juillet; Journ. des Débats, 28 Juillet; M. Studer's Catalogue.
— 11.	Calcutta and the neighbourhood.	Shocks of trifling importance.			Garnier, <i>loc. cit.</i> p. 118.
Aug. 7.	Urquhart, Dore, and near Inverness.	A slight shock, more severe to the west of the town.		The French authorities quoted give the date Aug. 17.	D. Milne's Catalogue of British Earthquakes, <i>loc. cit.</i> ; Moniteur, 5 Sept.; Journ. des Débats, 4 Sept. M. Studer's Catalogue.
— 8.	At the hospice of the Grimsel.				
— 11.	Saanen or Gessenay, canton of Berne.	Severe shocks .....			Ditto; Journ. des Débats, 29 Sept.
— 13.	Ditto. Rougemont, to the west of Saanen, is mentioned.	Ditto. These shocks recurred almost every day, but with less violence, until the middle of September, when some of great severity			Ditto.

1817. Aug. 19. About 5 P.M.	Innsbruck	Very in the Canton du Vaud). A very severe shock.		A bell was caused to sound. The motion was stronger on the banks of the Inn than in the town.	Journ. des Débats, 3 Sept.; Moniteur, 4 Sept.
— 23. About 8 A.M.	In the Morea, especially at Vostitza. But little perceptible at Corinth, but of remarkable intensity at Patras and in Ellis.	Many and violent shocks, which did not cease for eight days.	The sea in the neighbourhood of Vostitza was heated to such an extent, that the fishermen scalded their hands by dipping them into it.	Preceded by subterranean noise and detonation. The town of Vostitza was destroyed in seven or eight minutes, during a storm of opposite winds.	Journ. des Débats, 21 Nov. 1817 et 10 Janv. 1818; Mém. de Chronol. <i>loc. cit.</i> ; Pouqueville, Voyage, t. iii. p. 559, t. iv. p. 413.
— 31. Sept. 2. 3 <sup>h</sup> 30 <sup>m</sup> A.M.	Urbiquart, Doras, and near Inverness.	A smart shock.			D. Milne's Catalogue, <i>loc. cit.</i>
— 22. 2 <sup>h</sup> 30 <sup>m</sup> A.M.	Angoulême in the departm. Charente.	Another rather severe shock, the fifth since the beginning of August.			Journ. des Débats, 24 Sept.; Moniteur, 25 Sept.
— 22. 2 <sup>h</sup> 30 <sup>m</sup> A.M.	Angoulême in the departm. Charente.	Rather violent shocks, from N. to S., lasting 2 or 3 seconds.		A loud detonation was heard at the termination of the shocks.	Journ. des Débats, 7 et 22 Oct.; Moniteur, 10 Oct.
— 17. 3 P.M.	Yvonand in the Canton du Vaud.	A rather violent shock.		Earthquakes are said to be of extreme rarity at this place.	Journ. des Débats, 27 Oct.; Studer.
— 18. 10 <sup>h</sup> 30 <sup>m</sup> P.M.	In Sicily, at Catania and St. Helena.	A slight trembling.			Ann. de Chim. et de Phys. <i>loc. cit.</i> ; Bull. Univ. t. ix. p. 229.
— 31. Smyrna		Several successive shocks, lasting altogether 2 minutes.	Ships in the bay were agitated.	Articles were thrown from shelves, and the bells rang. Beasts and birds showed signs of terror.	Gentleman's Magazine, vol. lxxvii. pt. 2. p. 622.
— 31. Smyrna		A rather severe shock, which lasted several seconds, and was followed by others a little later.			Journ. des Débats et Moniteur, 28 Déc.
—	Macquarie Island in the S. Pacific.	Violent shocks, recurring frequently during the remainder of 1817, and up to April 1818.		Accompanied by subterranean noise	Garnier, <i>loc. cit.</i>

1.	2.	3.	4.	5.	6.
1817. Nov. 9	Part of Yorkshire, West- moreland, and Lancashire.				Gentleman's Magazine, vol. lxxxviii. pt. 2.
— 12. About 3 A.M.	Geneva and the neighbourhood.	A severe shock. The direction was from above downwards(?) A rather severe shock.	The waters of the lake of Geneva were momentarily raised.	Accompanied by a loud detonation and noise like the fall of a very heavy body.	Journ. des Débats, 21 et 24 Nov.; Moniteur, 1 et 8 Déc.; Studer. Journ. des Débats, 10 Déc.
— 2 A.M.	Longue near Saumur, in the departm. Maine-et-Loire.				Journ. des Débats, 21 et 24 Nov.; Moniteur, 1 et 8 Déc.; Studer.
— 20. At night.	Gadman in the Bernese Oberland.	A trembling. About this time several shocks were felt in the same district.			Quart. Journ. Roy. Inst. vol. v. p. 135.
— 22. In Greenland.		A severe shock.			Moniteur, 23 Fév. 1818; Journ. des Débats, 24 Fév. 1818.
1818. Jan. 9. At night.	St. John in the island of Antigua.	Shocks of the most alarming character, lasting several seconds.			Ann. de Chim. et de Phys. t. xxxiii. p. 402; Garnier.
— 9th 9th A.M.	Hayfield in Sweden.	One shock.			Gentleman's Magazine, vol. lxxxviii. pt. 1. p. 71.
— Feb. 6.	Comingsby in Lincolnshire.	Slight. Lasted some seconds.	Accompanied by an inundation of the sea.		Ditto, vol. lxxxviii. p. 1. p. 171; Quart. Journ. Roy. Inst. vol. v. p. 135; Ann. de Chim. et de Phys. t. ix. p. 433.
1818. Jan. 9. At night.	Rouffach, Soultz, and Belfort in the departm. Haut-Rhin. Not felt at Colmar.	A severe shock.			Ann. de Chim. et de Phys. t. ix. p. 433; Journ. des Débats, 6 Mars; Journ. de Phys. t. lxxxviii. p. 35; Garnier.
— 10th 30th P.M.	In Aberdeenshire.				D. Milne's Catalogue, loc. cit.

1818. Feb. 20. 3 P.M.	At Coningsby in Lincolnshire and the country round. Felt also at Kirton in Lindsey.			Accompanied, as the former shock, by noises like the firing of cannon. At Kirton in Lindsey a meteor was seen about the size of a cannon-ball, with a luminous streamer behind it, and moving with great velocity.	Gentleman's Magazine, vol. lxxviii. pt. 1. p. 364.
7 <sup>h</sup> 10 <sup>m</sup> P.M.	At Catania, and in Calabria and Malta.	A severe shock, followed by another of less intensity, during the night. The motion was from S.E. to N.W., according to some oscillatory, and lasted, by varying accounts, from 10 to 40 seconds.	The sea was calm during the morning, but rose in froth upon the shore, owing to an unperceived (distant?) storm. At a place on the coast where the sea was tranquil, a vessel at anchor touched (or seemed to touch) the bottom thrice with her keel.	The sky was clear, the air calm and mild. The moon was beautifully bright. Animals showed signs of alarm before the earthquake. Etna had been quiet since 1811, but at dawn this day flames were observed issuing from small cracks in the old beds of lava, accompanied by alight explosions. The water in wells was troubled some days before the shocks; and at a place named Parnapolo, fourteen considerable jets of salt water rose suddenly with a loud noise from the earth to the height of 6 palms. This phenomenon occurred five or six minutes before the shock, and lasted about twenty minutes. The apertures from which the water had issued were so hot two days afterwards that it was impossible to plunge the hand into them. Near the same place a subterranean noise like thunder was heard. The water in the basins of public fountains was in part thrown out at each shock. Some statues were remarked as having been moved a little in azimuth; and a considerable mass of stone at Syracuse was turned 25° from the east towards the south. The walls in some houses were seen to open <i>horizontally</i> (?), so that the light of the moon penetrated for an instant, and then closed again, without leaving very perceptible traces of fracture. In Catania great masses of stone were thrown from the tops of buildings, and a colossal statue of an angel lost both its arms, as if they had been cut sharply off. At many other places public and private buildings were thrown down, and 69 persons were killed or wounded. The atmosphere soon after became cloudy.	Ann. de Chim. et de Phys. t. ix. p. 433, t. xix. p. 435 et suiv., t. xxi. p. 402; Journ. des Débats, 26 et 31 Mars; Bibl. Univ. t. ix. Nov. 1818, p. 228.



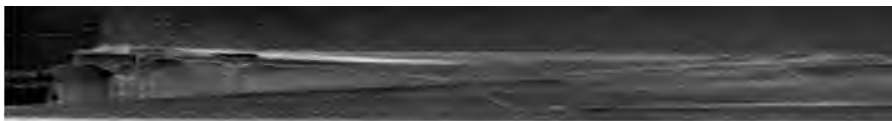
1.	2.	3.	4.	5.	6.
Feb. 22. 3 <sup>m</sup> (A.M. -M. 2).	Turin .....	A shock from N. to S.	.....	.....	Mém. de l'Acad. de Turin, t. xxiii. p. 397.
—	Genoa and Milan .....	Two shocks .....	.....	.....	Ditto.
— 23.	Turin, Genoa, Savona, Alanco, and San Remo.	At Turin there were two shocks; at the other places they continued at inter- vals for two days.	.....	During a storm which raged this day over Pro- vence and the north of Italy. At some towns several houses were injured.	Quart. Journ. Roy. Inst. vol. v. p. 134.
—	Marseilles, Draguignan, Oreille in Savoy, An- tibes and Venice in the departm. Var.	At the first three places the shocks were very severe, and from N.W. to S.E. At Antibes there were three oscillations from S.E. to N.W. in 3 seconds.	At Antibes the sea dashed violently against the rocks just before the shock.	Accompanied by a dull subterranean noise. At Antibes the weather had been very rough; at a few minutes past 7 P.M. a tremendous rush of wind took place, and then sank into a calm; the subterranean noise was then heard, and the shock took place. The wind then rose, and the storm raged as before. At Venice several houses fell. This shock and the fol- lowing ones were felt throughout Provence, where no earthquake had been experienced for eleven years before.	Ditto; Ann. de Chim. et de Phys. t. ix. p. 433, t. xxxviii. p. 402; Journ. des Débats, 6 et 12 Mars; Moniteur, 12 Mars; Journ. de Phys. t. lxxxviii. p. 35.
—	Antibes .....	Another shock " .....	.....	.....	Ditto.
— 24. A.M.	Marseilles, St. Remi (Bouches-du-Rhône), and in part of the de- partm. Var.	Ditto. On this day, and the following several shocks were felt in the Var.	.....	.....	Ditto.
—	Antibes .....	Another shock .....	.....	.....	Ditto.
— mid-day.	In the Madaines (Sicily).	Shocks began on this night which con- tinued from time to time until April 1819. The most considerable were these first shocks and those of the 8th Sept.	.....	.....	Ditto.
— between md 25.	Felt over a very limited district. The centre of disturbance seemed to be in the neighbour- hood of Petrol and Fo- lizzi.	.....	.....	.....	.....
— 25. A.	Vence, Marseilles, and Aix.	A slight shock .....	.....	.....	Ann. de Chim. et de Phys. &c. just quoted.

11 <sup>h</sup> 15 <sup>m</sup> P.M.	Catania	Two more shocks	Did great damage	Ditto, t. xxxiii. p. 402.
— 27.	Ditto	Shocks were supposed to have been felt.	During a tempest comparable to that of 1786	Ditto, and other authorities quoted above.
— Night between 28th Feb. and 1st March.	The Mauritius			Journ. des Débats, 21 Juin.
— March 1.	St. Remy in the Puy-de-Dôme.	A slight shock		Ann. de Chim. et de Phys. t. xxxiii. p. 402; Garnier.
— 4 A.M.	2. In the departm. Var, and at Nice.	Ditto. Lasted 4 sec. Followed by three oscillations after an interval of 8 sec.		Ditto.
— — —	In the Val-di-Noto, Sicily.	Rather severe shocks.	A column of smoke rose at the same time from Mount Etna.	Ditto.
— 9.	St. Remy. (In the Puy-de-Dôme, in the Bouches-du-Rhône, or S.W. of Savona?)	Another slight shock.		Ditto, p. 403.
— 15.	Ditto			Ditto.
— 18.	Bencoolen in Sumatra	The effects of this earthquake were experienced at a considerable distance out to sea.	Very little damage done.	Quart. Journ. Roy. Inst. vol. vi. p. 168.
— ?	Philippoli in Romania	An earthquake	This city of 70,000 inhabitants is said to have been entirely swallowed up in subterranean chasms, so that no traces of it remained. The account is manifestly exaggerated; but what foundation, if any, had it? The event is said to be announced in letters from Bucharest of the 17th March, but the date of the earthquake is not given.	Journ. des Débats, 11 Juin.
— April 8.	Commune of Latour in Piedmont.	A violent shock at the time mentioned, followed by four more; and, two hours after, by other slighter ones.	The inhabitants left their houses	Ann. de Chim. et de Phys. loc. cit.; Quart. Journ. Roy. Inst. vol. v. p. 372.
— 0 <sup>h</sup> 15 <sup>m</sup> A.M.				

1.	2.	3.	4.	5.	6.
1818. April 9.	Commune of Latour in Piedmont.	Several slight shocks			Ann. de Chim. et de Phys.
— 30.	Ancona	A single shock of trifling importance.			Ann. de Chim. et de Phys. t. ix. p. 433.
—	Extending from one side of Lincolnshire to the other, and across Hol- derness in Yorkshire.	A smart shock.			D. Milne's Catalogue of British Earthquakes, <i>loc. cit.</i>
— May 3.	Ancona	A strong shock			Ann. de Chim. et de Phys. t. xxxiii. p. 403.
—	16. Island of St. Thomas in the West Indies. The Montieur says Ile de la Trinité, perhaps Trinidad.	A severe shock, followed by another at 9 <sup>h</sup> 30 <sup>m</sup> A.M. (9 <sup>a</sup> according to the Montieur.)			Quart. Journ. Roy. Inst. vol. vi. p. 168; Montieur, 8 Sept.
—	17. Metz in Savoy	From S.E. to N.W.			
—	21. Island of Martinique	A slight shock		Preceded by loud detonations. The sky was serene.	Ann. de Chim. et de Phys. t. xxx. p. 403; Garnier.
9 P.M.	28. Brudeis (Budweis?)	Very violent shocks; most severe in the highest parts of the mountains.			Ann. de Chim. et de Phys. t. xxxiii. p. 403; Garnier.
—	A little before Krannau, Rosenberg, and fore mid-in the mountains between Bohemia and Austria.	A severe earthquake.			Ditto; Gentleman's Magazine, vol. lxxviii. pt. 1. p. 554.
—	31. At Mexico			Many of the public and other buildings of the city and neighbourhood suffered materially. Amongst others, a number of the arches of the aqueduct of Santa Fé were rent, and discharged quantities of water.	Ann. de Chim. et de Phys. t. xii. p. 425; Montieur, 16 Nov.; Quart. Journ. Roy. Inst. vol. vi. p. 370.
— June 1.	Jamaica	A violent shock, felt throughout the whole island.			Ann. de Chim. et de Phys. t. xxxiii. p. 403, t. viii. p. 415; Garnier.
— 9.	Loch Awe, Scotland			Preceded by a loud rumbling noise	Tilloch's Magazine, vol. li. p. 467.
2 <sup>d</sup> 20 <sup>m</sup> P.M.	19. Comrie in Perthshire	Two shocks, with an interval of a minute.			D. Milne's Catalogue of British Earthquakes, <i>loc. cit.</i>
— July 19.	Perpignan, Pau, and throughout the valley of Orthéz.	Some shocks in the direction of the chain of the Pyrenees.		Said to be accompanied by heavy rain, and followed by great electrical explosions. Stormy weather was frequent after the shocks.	Journ. des Débats, 1 et 8 Août; Montieur, 3 Août; Ann. de Chim. et de Phys. t. ix. p. 433; Quart. Journ. Roy. Inst. vol. vi. p. 168.
7 A.M.					

1818. July 22. 10 P.M.	Unspruck in the Tyrol. A severe shock, from W. to E.; the oscillation lasting some seconds.	Accompanied by a rolling noise like thunder	Ann. de Chim. et de Phys. t. ix. p. 433; Quart. Journ. Roy. Inst. vol. vi. p. 168.
— 27. 1 P.M.	Albano in Italy A slight shock	The Quarterly Journal of the Roy. Inst. gives the date August 27.	Journ. des Débats, 15 Août; Ann. de Chim. et de Phys. t. xxxiii. p. 403.
— 30. 4 <sup>h</sup> 44 <sup>m</sup> P.M.	Jassy in Moldavia A violent shock, lasting some seconds. A second, of less violence, was supposed to have been felt about midnight. Severe shocks		Journ. des Débats, 10 Sept.; Moniteur, 12 Sept.; Quart. Journ. Roy. Inst. vol. vi. p. 169.
— End of the month.	At Mexico		Ann. de Chim. et de Phys. t. xxxvii. p. 403.
— Aug. 3. 8 A.M.	Castiglione in Italy		Gentleman's Magazine, vol. lxxxviii. pt. 2. p. 173.
— At night.	Rome, Albano, and Frascati. Ditto		Ann. de Chim. et de Phys. loc. cit.
— Sept. 1.	In the island of Candia. A severe shock		Ditto.
— 5 <sup>h</sup> 30 <sup>m</sup> (A.M. or P.M.?).	Inverness in Scotland A shock of rather long duration.		Ditto; Moniteur, 27 Oct. D. Milne's Catalogue, loc. cit.
— 11 <sup>h</sup> 30 <sup>m</sup> P.M.	Palermo. The shock seemed to be confined in extent to the city. A league and a half to the west of Lisbon, but not in the city itself (?). A severe shock		Ann. de Chim. et de Phys. loc. cit.
— Oct. 2. 1 <sup>h</sup> 30 <sup>m</sup> P.M.	Brutensorg. Batavia. Felt in the mountains as well as in Batavia.		Ditto; Journ. des Débats, 6 et 8 Oct.; Moniteur, 9 Oct.
— 11.	Along the base of the mountain to the north of Quebec.	The houses were violently shaken, windows rattled, mortar fell from the walls, and bells rung. Some houses had the walls rent open. People who were standing up became giddy by the motion of the ground. The windows and furniture of the houses were shaken.	Moniteur, 13 Oct.; Ann. de Chim. et de Phys. t. ix. p. 433. Quart. Journ. Roy. Inst. vol. vii. p. 396; Garnier. Quart. Journ. Roy. Inst. vol. vi. p. 376; Ann. de Chim. et de Phys. t. xii. p. 425.

1.	2.	3.	4.	5.	6.
1818. Oct. 31. Night between 4 & 5.	Dalton in Low Furness, Lancashire.			It is said that a shock was felt at the same place about a year before, and that such convulsions are not rare in the line of country which extends along the western coast from Lancashire to Ayrshire.	Quart. Journ. Roy. Inst. vol. vi. p. 370; Ann. de Chim. et de Phys. t. xii. p. 425.
—	In Iceland	A dreadful shock.		Accompanied by subterranean noises and horrid crashes, at the close of which an eruption from Mt. Hecla commenced.	Ditto.
Nov. 4 & 5.	Nov. Aquigrana (Aix-la-Chapelle). The same shocks were felt in the whole of the town of Witchesbach.	A shock of but little violence, followed, after sunrise, by a second, which was again succeeded in a few minutes by renewed motion.		The last felt motion was accompanied by a noise like that of a distant cannonade.	Ann. de Chim. et de Phys. t. xxxiii. p. 403; Moniteur, 14 Nov.
0 <sup>h</sup> 20 <sup>m</sup> A.M.	Inverness, and to some distance round the town. Felt with great violence along the banks of Loch Ness.	Two shocks, in three seconds. Preceded on the evening of the 10th and succeeded the next morning by slighter shocks.		Accompanied by a noise like thunder. Bells rang of themselves.	Gentleman's Magazine, vol. lxxviii. pt. 2. p. 557; Ann. de Chim. et de Phys. t. xii. p. 425; Moniteur, 27 Nov.; Quart. Journ. Roy. Inst. vol. vi. p. 370.
Before the 14th.	In the neighbourhood of Lisbon.	Several slight shocks had been felt for some time before the 14th.		Occasioned much alarm	Moniteur, 12 Déc.
20.	Cap Henri in St. Domingo.	Two severe shocks		Five persons were killed and some houses were destroyed.	Ann. de Chim. et de Phys. t. xxxiii. p. 403 et t. viii. p. 415; Moniteur, 18 Janv. 1819; Quart. Journ. Roy. Inst. vol. vii. p. 191.
Dec. 7. 9 A.M.	Bangor in N. Wales, and much more sensibly in the neighbourhood of Penter.	Very slight at Bangor.		At Penter the motion was described as being as if the earth had sunk nearly a yard under the feet. The Ann. de Chim. et de Phys. mentions another slight shock as felt at this place on the 14th at 9 A.M., but it is probably confounded with the event here recorded.	Quart. Journ. Roy. Inst. vol. vi. p. 371; Ann. de Chim. et de Phys. t. ix. p. 433 et t. xxxiii. p. 403.
8.	Parma, Genoa, Modena.	At Parma the shock			Ann. de Chim. et de Phys. loc. cit.;



cc. 9. Parma .....	The oscillations, from S. to N., lasted fourteen seconds.	.....	A church fell .....	Ditto.
— 10. Reggio .....	Another slight shock.	.....	.....	Ditto.
— 20. Island of St. Domingo ..	A violent shock .....	.....	From this month up to the 21st May 1819, eight earthquakes were felt in the Antilles, of which seven occurred between 9 and 11 P.M. The motion consisted <i>as usual</i> of gentle oscillations without actual shocks.	Ann. de Chim. et de Phys. t. xxxiii. p. 403, t. viii. p. 415; Cuvier, Hist. des Sc. Nat. t. ii. p. 169.
.....	.....	.....	.....	Phil. Trans. for 1836, p. 21.
Copapo .....	.....	.....	Several of the inhabitants fled into the country.	Ann. de Chim. et de Phys. t. xii. p. 426.
an. 8. Genoa. Not felt at Nice or Alasio.	.....	Vessels at sea were very much agitated, so that the shock was supposed greater there than on land.	.....	.....
— 17. Aamodt in the Osterdal, en 1 Sweden.	Began by a rolling motion from W. to E., which was followed by a shock of short duration.	.....	In some places furniture was moved about and Registridanden for 1819, Nr. 10. the glasses were caused to ring.	.....
— 24 St. Ubes in Portugal .....	Several slight shocks.	.....	.....	Ann. de Chim. et de Phys. t. xxxiii. p. 404; Quart. Journ. Roy. Inst. vol. vii. p. 191.
— 29. Tiflis in Georgia .....	Several shocks, which became very violent at 10 o'clock.	.....	.....	Quart. Journ. Roy. Inst. vol. vii. p. 397.
— 1. Tabriz in Persia .....	Very numerous shocks, extending over several weeks, about this time; the exact days not mentioned.	.....	.....	Silliman's Journal, vol. xxxvii. p. 351.
b. 1. Parma .....	A slight shock .....	.....	.....	.....
— 8. Genoa .....	Violent shocks .....	.....	The towns of Port-Maurice and San-Remo were injured. The date should probably be January 8.	Ann. de Chim. et de Phys. t. xxxiii. p. 404. Huot, Géol. t. i. p. 114.

1.	2.	3.	4.	5.	6.
1819. Feb. 11. 5 P.M.	Balleuluan in Glenlyon, Scotland.	A smart shock		Immediately followed by a tremendous gale and much snow.	Quart. Journ. Roy. Inst. vol. vii. p. 191.
— 24. At night.	Palermo	Several shocks.		Some houses were shaken down. During the fourteen days preceding the 4th of March the weather was dreadful, and three shocks of earthquake occurred.	Ann. de Chim. et de Phys. t. xii. p. 426.
— Same night.	Near Morbio in the Can- ton of Ticino.	A trembling.			Ditto.
— 26.	Rome, Frascati, and Al- bano.	Shocks from S.E. to N.W.			Ditto.
— 28.	Tiflis in Georgia.	Several shocks.		Preceded by subterranean noise. Old houses were thrown down.	Ditto.
At night.	In Syria	Severe shocks			Ditto.
End of the month.					
— March 7.	Kiashta on the frontiers of China.	A prolonged shock			Ditto, t. xxxiii. p. 404.
— 18.	Fort Marlborough on the western coast of Su- matra.	A very violent shock.			Garnier, Météor. p. 123.
—	Oran and Mascara, in Morocco.	Shocks lasting an hour.		A great number of the inhabitants disappeared beneath the ruins.	Ann. de Chim. et de Phys. t. xii. p. 426.
— April 3.	Copaiapo in Chili.	Very violent		The whole city was destroyed by the shocks of this day and of the 4th and 11th. The in- habitants had barely time to save their lives.	Quart. Journ. Roy. Inst. vol. viii. p. 355; Garnier, Météor. p. 123.
— 4.	Ditto	Ditto			Ditto.
— 8.	Temeswar in Hungary.	Three shocks			Ann. de Chim. et de Phys. t. xii. p. 426.
— 10.	Landshut and Augs- burg.	A slight shock.			Ditto; Quart. Journ. Roy. Inst. vol. vii. p. 397.
— 11.	Copaiapo	The last of the three dreadful shocks of this month.			Quart. Journ. Roy. Inst. vol. viii. p. 355; Garnier, loc. cit.
— May 26. 6 P.M.	Corneto in the States of the Church. The shocks were felt along the Mediterranean.			Several houses fell, and a great number of people perished.	Ann. de Chim. et de Phys. loc. cit.; Journ. des Débats, 17 Juin; An- nual Register, 1819, p. 39.
— 27. A.M.	In Sicily	A violent shock		An eruption of Etna began, the mountain having been perfectly at rest for the preceding three years.	Ann. de Chim. et de Phys. loc. cit.; Journ. des Débats, 26 Juin.

1819. May. End of the month.	In the neighbourhood of Viterbo.	Violent shocks.	.....	Doubtless the same with those at Corneto on the 26th.	Journ. des Débats, 26 Juin.
June 16. Between 6 <sup>h</sup> 45 <sup>m</sup> and 50 <sup>m</sup> P.M.	Cutch, and other parts of the north of India, including a space of about 18° lat. by 20° long. Extended north, as far as Ahmedabad, where much damage was done. Also slight- ly felt at Poona.	The severe shocks lasted about two minutes and a half, and their general direction was pro- bably from S.W. to N.E.	.....	The violence of this remarkable earthquake was so great that people could scarcely keep their feet, and the waving motion of the ground was quite visible. The earthquake was accom- panied by a violent gust of wind and a noise like that of a large flight of birds. Many meteors or falling stars were observed on the night after. Many other shocks occurred during the night, and at intervals until the 23rd of November. The whole district of Cutch was ravaged, and Bhooji, the capital, was changed to a heap of ruins, 2000 of the inhabitants perishing. Many other towns and villages suffered much. The most remarkable effects of this earthquake were the subsidence of "Sindree" and elevation of the "Ullah Bund," for details of which see Lyell's 'Prin- ciples of Geology.'	Transactions of the Literary Society of Bombay, vol. iii. p. 90.
8 <sup>h</sup> 30 <sup>m</sup> P.M.	Calcutta, Muttra, Chu- nar, Mirzapora, Myn- pooree, Jionpoor, Sul- tanpoor, Surat, Brouch, Kaira, &c.	Two shocks with an interval of about two minutes. The first lasted thirty or forty seconds. At Jionpoor there were three distinct oscil- lations from W. to E., lasting twenty- five seconds. At Sultan- poor the shock was very awful.	.....	.....	Asiatic Journal, vol. ix. pp. 70, 79, 184, 307, 310, 384; Quart. Journ. Roy. Inst. vol. viii. p. 356, vol. ix. p. 206; Lyell, Geol. p. 437.
17. Ditto	.....	Another shock	.....	.....	Ditto.
18. Ditto	.....	Two ditto	.....	.....	Ditto.
20. Ditto	.....	Two more shocks	.....	.....	Ditto.
July. Between Night 2.	Catania; felt still more strongly at Chiara- monte.	A very severe shock	.....	On this day the volcano called Denodur, thirty miles N.W. from Bhooji, is said to have burst into eruption, and the convulsions ceased. The eruption of Etna continued, but with so much smoke that no flame was visible.	Journ. des Débats, 11 Août.



1.	2.	3.	4.	5.	6.
1819, July 10, 6 <sup>h</sup> 45 <sup>m</sup> P.M.	Guérande in the departm. Loire-Inférieur.	A slight shock from N. to S.		Accompanied by noise like prolonged thunder.	Journ. des Débats, 24 Juillet; Ann. de Chim. et de Phys. t. xii. p. 426. Ann. de Chim. et de Phys. t. xxxiii. p. 404.
— 28.	Munich	A severe shock			Ditto, t. xii. p. 426.
End of the month.	Olette in the eastern Pyrenees.	A slight shock.			
— Aug. 5.	Constantinople	A severe shock			Ditto, t. xxxiii. p. 404.
— 12.	Island of Trinidad	Undulatory motion from E. to W., very severe, and lasting four or five seconds.		Preceded by a rushing noise, as of wind. It was a clear moonlight night, and nothing particu- lar was remarked in the state of the atmo- sphere. Two shocks were also felt at the same time in Grenada and St. Vincent.	Quart. Journ. Roy. Inst. vol. viii. p. 356; Ann. de Chim. et de Phys. t. xii. p. 426; Moniteur, 24 Nov.
— 2 <sup>h</sup> 30 <sup>m</sup> A.M.				Attended by noise like the firing of cannon	
— 15.	St. Andrews in Lower Canada.			The noise was like that of a carriage passing rapidly over a stone bridge.	Tilloch's Magazine, vol. liv. p. 316; Ann. de Chim. et de Phys. t. xii. p. 426.
— 18.	Voss in Sweden	Five shocks, of which the first was the most severe.			Rigstidenden for 1819, Nr. 20.
Between 9 <sup>h</sup> 15 <sup>m</sup> and 11 <sup>h</sup> 45 <sup>m</sup> A.M.		A shock			
— 29.	Staldalen (Saltalden?) in Norway.				Ann. de Chim. et de Phys. t. xii. p. 426; Bull. de la Soc. Géol. t. vii. p. 29.
— 30.	Ditto	Ditto			Ditto.
— 31.	Throughout a large di- strict in Norway. Espe- cially at Salten and Helgeland in the pro- vince of Nordland. At Frosten and at Dron- stadsbygd, 2 miles from Drontheim, at 3 <sup>h</sup> 15 <sup>m</sup> (?).	At Saltalden the shock seemed to come from the S.W., and to extend across the Fiord. The shocks lasted six minutes, and were followed by other slight ones at 5 <sup>h</sup> and 7 <sup>h</sup> 5 <sup>m</sup> P.M. At Lunrøe the di- rection seemed to be S. to N., and the shocks lasted ten	At Hemmoes the sea was as much agi- tated as in the most violent tempests, al- though the air was calm.	At Saltalden there was a loud noise; the houses shook, and the windows rattled. The water of a little stream was rendered turbid. At Lunrøe also streams were disturbed, and stones of considerable size were rolled down from the hills. At Hemmoes chimnies were thrown down and water thrown up into the air. Noises accompanied by slight shocks were heard almost every day up to the 20th of October.	Ditto; Rigstidenden for 1819, Nrs. 83, 85, and 99.

1819. Aug. 31.	Vrola in Russian Lap-land.	until 7 the next morning. At Hennes the direction seemed to be E. to W., and at Stabsbygdén it was S. to N.	.....	.....	.....	Moniteur, 20 Nov.
— — —	Venice .....	A vibration sufficiently strong to throw down chairs and other furniture.	.....	.....	.....	Ann. de Chim. et de Phys. t. xii. p. 426.
— Sept. 4. 9 p.m.	Corfu .....	Two violent shocks, directed towards the north (S. to N.?).	.....	.....	All the bells of the town rang from the effect of the shock. The moon shone very brightly, and the air was quite serene. The Quart. Journ. Roy. Inst. gives the date Sept. 11.	Ann. de Chim. et de Phys. t. xii. p. 426. vol. ix. p. 205.
— — — 28 and 29.	Lunrøe in Norway .....	Slight shocks .....	.....	.....	.....	Keilhau.
— — —	Irkutsk .....	A violent shock .....	.....	.....	.....	Ann. de Chim. et de Phys. t. xxxiii. p. 404.
— — — Oct. Night between 2 and 3.	Saltalen, Drontheim, &c. in Norway.	An earthquake .....	.....	.....	.....	Ditto.
— — — 16.	Island of Martinique.	The duration of the shocks was more remarkable than their intensity.	.....	.....	.....	Ditto, t. xii. p. 426; Moniteur, 24 Nov.
— — — One hour after midnight (of the 15th?).	Also felt at St. Lucia.	.....	.....	.....	.....	.....
— — —	Lunrøe in Norway .....	More shocks .....	.....	.....	.....	Memoir of M. Keilhau on Norwegian earthquakes.
— — — 19 and 20.	Island of St. Thomas in the West Indies.	Three shocks .....	.....	.....	.....	Quart. Journ. Roy. Inst. vol. viii. p. 356.
— — — 20.	Hemne in Norway .....	A slight shock .....	.....	.....	.....	Keilhau.
— — — 31.	Plaue in Saxony .....	A very severe shock .....	.....	.....	.....	Ann. de Chim. et de Phys. t. xxxiii. p. 404.
— — — Nov. 10.	Lunrøe in Norway .....	A severe shock .....	.....	.....	.....	Keilhau.
— — — About the middle of the month.	Montreal in Canada .....	A slight shock .....	.....	.....	.....	Quart. Journ. Roy. Inst. vol. ix. p. 205; Ann. de Chim. et de Phys. t. xv. p. 421.
— — — 21.	Lunrøe in Norway .....	Another slight vibration.	.....	.....	.....	Keilhau.

1.	2.	3.	4.	5.	6.
Nov. 28. 10 <sup>th</sup> A.M.	Comrie in Perthshire, extending several miles round the village.	A severe shock from the N.W.; lasted 10 secs. More alarm- ing than any felt here for ten years before.		Accompanied by the usual hollow grumbling sound. Furniture, plates, &c. were moved about and jingled.	D. Milne's Catalogue, <i>loc. cit.</i> ; Quart. Journ. Roy. Inst. vol. ix. p. 203; Ann. de Chim. et de Phys. t. xii. p. 426.
Dec. 3.	Laurœ in Norway	Another slight shock.		Houses and furniture shook, and the whole went away with a noise like the slow passing of carts.	Keilhan. Quart. Journ. Roy. Inst. vol. ix. p. 205; Ann. de Chim. et de Phys. t. xv. p. 421.
0 <sup>th</sup> P.M.	4. Amalree in Scotland	Two or three se- conds. Direction, —by the Grampian Hills eastward.			Keilhan. Ann. de Chim. et de Phys. t. xv. p. 421; Quart. Journ. Roy. Inst. vol. ix. p. 206.
—	17. Laurœ in Norway	Another slight shock.			Ann. de Chim. et de Phys. t. xxxiii. p. 404.
—	20. Mittenwald in Bavaria	Shocks from S. to N., lasting seven or eight seconds.			Keilhan. Ann. de Chim. et de Phys. t. xxxiii. p. 404.
—	Foligno in Italy	Several shocks			Keilhan. Ditto.
—	Jan. 3.	A feeble shock			Ditto.
—	10. Ditto	Ditto			Ditto.
—	12. Ditto	A severe shock			Ditto.
—	17. Pistoia in Tuscany	Undulatory, from W. to E., lasting four or five seconds.		Accompanied by very loud noise. An eruption of Vesuvius began on the 16th.	Ann. de Chim. et de Phys. t. xxxiii. p. 404.
—	19. Voss in Norway	A rather severe shock.			Keilhan.
—	20. Laurœ in Norway	A severe shock			Ditto.
—	22. Port Glasgow; also felt at Condrie (Comrie?).	A strong earthquake, consisting of three distinct shocks, com- ing apparently from the N.	The waters of Loch Lomond were agi- tated and rose some- what, so that some persons who were crossing it were alarmed by the sud- den rippling of the water.	The rumbling noise as well as the motion seemed to come from the north. A rapid thaw had commenced that morning, succeeding a long and sharp frost.	Quart. Journ. Roy. Inst. vol. ix. p. 206; Ann. de Chim. et de Phys. <i>loc. cit.</i>
—	27. Bhooj in Cutch, Hin- dostan.			Attended by a loud noise like distant thunder...	Trans. Lit. Soc. of Bombay, vol. iii. p. 90.

3 P.M.	Lunrøe in Norway ..... 31 Island of St <sup>a</sup> Maura in Altogether 424 shocks, the Archipelago.	short duration. A strong shock apparently from various directions. Six of the shocks were much more violent than the rest, the worst of all occurring on the 17th of March.	Accompanied by subterranean noises. Veauvius exhibited more than usual agitation during the whole of this period.	p. 422. Keilhan. Brugnatelli, Giornale di Fisica, 1820, p. 144.
and February.	Moor in Hungary .....	Numerous shocks .....	Great damage done.....	Langlois, Dict. de Géogr. art. Moor.
Feb. 8.	Lunrøe in Norway .....	A slight shock.....	A dull noise was heard from the morning, followed by a violent storm, and afterwards the shock. Numbers of the buildings fell, and the square in the centre of the town sank. A new island was said to have appeared in the neighbourhood.	Keilhan. Ann. de Chim. et de Phys. t. xv. p. 422.
21.	St <sup>a</sup> Maura .....	A shock, said in the Ann. de Chim. et de Phys. to be the most violent of those felt about this time in St <sup>a</sup> Maura.	During a violent eruption of Veauvius .....	Ditto, t. xxxviii. p. 142.
11 <sup>h</sup> 30 <sup>m</sup> P.M.	Chiatimone .....	A shock .....	Accompanied by a very intense subterranean noise. A new volcano appeared in the inland of Turinak, 100 wersts from Unalaska.	Garnier, Météor. p. 127.
Mar. 3.	Unalaska, one of the Aleutian Isles.	A great shock .....	.....	Brugnatelli, Giornale di Fisica, 1820, p. 144.
At night.	St <sup>a</sup> Maura .....	According to the Giornale di Fisica, the worst of the shocks of this period.	.....	.....
9 A.M.	Island of Chios .....	One shock .....	In the midst of a great tempest. Much damage done.	Ann. de Chim. et de Phys. t. xv. p. 422.
April 2.	Lunrøe in Norway .....	A strong shock .....	Accompanied by a noise like the rolling of a heavy carriage over pavement.	Keilhan. Ann. de Chim. et de Phys. t. xv. p. 422.
6.	Cork, Ireland, and the neighbouring towns.	The motion lasted about eight or ten seconds at Cove.	Accompanied at Cove by a rumbling noise. At Aghada the noise was like the firing of cannon. This is doubtless the same event with that reported as having happened on the 6th; but which is the correct date?	Quart. Journ. Roy. Inst. vol. ix. p. 425.
Between 2 and 3 A.M.	Cove, Aghada, Middleton, and the neighbourhood of the mouth of Cork harbour.	.....	.....	.....

2.	3.	4.	5.	6.
Apr. 17. Luröe in Norway .....	A severe shock .....			Keilhan.
— 21. Brest .....	Very sensible motion, .....		Accompanied by dull explosive noises, lasting Ann. de Chim. et de Phys. t. xv.	p. 422.
— 22. Island of Curaçoa .....	A severe earthquake .....			Ditto, t. xxxiii. p. 404.
May 4. Acapulco .....	Commencement of .....			Dupetit-Thouars, Voyage de la Vé-
— 7. Irkutsk .....	very violent shocks, .....			nus, t. ii. p. 213.
— 7. Irkutsk .....	A shock of such vio- .....			Moniteur, 3 Août.
— 10. Acapulco .....	lence that the houses .....			Dupetit-Thouars, loc. cit.
	could be perceived .....	The sea retired from .....		
	to lean towards the .....	half the bay, leaving .....		
	north (?).	the rocks dry. The .....		
		motion was that of .....		
		alternate flux and .....		
		reflux, with an in- .....		
		terval of rest at the .....		
		highest and lowest .....		
		levels. After two .....		
		hours the sea re- .....		
		turned, and rose to .....		
		a church on the .....		
		highest side of the .....		
		town. When the .....		
		water retired for .....		
		the second time the .....		
		mole was left almost .....		
		entirely covered with .....		
		sand, and a greater .....		
		surface of the bay .....		
		was exposed. The .....		
		sea then gradually .....		

Time	Place	Phenomena	Accompanied by volcanic eruption	Earthquakes.
June 11. 11 <sup>h</sup> 30 <sup>m</sup> (A.M. or P.M.?).	Gunong-Api in the island of Banda.	An earthquake	.....	Earthquakes. Garnier, <i>Météor.</i> p. 127.
—	Lunrøe in Norway	A feeble shock	.....	.....
—	Innspruck	A rather severe shock	.....	.....
July 5. 3 <sup>h</sup> 25 <sup>m</sup> A.M.	Tiflis in Georgia	Two shocks	.....	.....
—	Innspruck. Also felt at Swatz and the moun- tain of St. George's.	A strong trembling, lasting four seconds.	.....	.....
7 <sup>h</sup> 30 <sup>m</sup> A.M.	.....	.....	.....	.....
Aug 10.	Lunrøe in Norway	Four alight shocks	.....	.....
—	Ditto	Two ditto	.....	.....
—	Ditto	One ditto	.....	.....
—	Island of Curaçoa. Not felt in the Antilles.	A severe shock	.....	.....
About 2 P.M.	.....	.....	.....	.....
—	Lunrøe in Norway	Another alight shock.	.....	.....
—	Ditto	Ditto	.....	.....
—	At sea, between Sicily and the Morea, in lat. 36° 12'	.....	.....	.....
Sept. 14.	Lunrøe in Norway	Another alight shock	.....	.....
—	Barnmouth in Merioneth- shire.	A shock	.....	.....
9 P.M.	.....	.....	.....	.....
Oct. 10.	Lunrøe in Norway	Another slight shock	.....	.....
—	Honduras, Omba, and St. Pardo.	.....	.....	.....
—	.....	.....	.....	.....
23.	Berne	A slight trembling	.....	.....
24.	Kamtschatka	Several shocks from N. to S. Very vio- lent, lasting alto- gether three mi- nutes.	.....	.....

1.	2.	3.	4.	5.	6.
1820. Nov. 13. At night.	Marseilles .....	Several people <i>believed</i> that they felt a slight earthquake shock.			Ann. de Chim. et de Phys. <i>loc. cit.</i>
8 <sup>h</sup> 13 <sup>m</sup> P.M.	Island of Antigua .....	A shock of rather long duration.			Ditto.
7 <sup>h</sup> 40 <sup>m</sup> A.M.	Ditto .....	Another shock .....			Ditto.
8 A.M.	Leadhills and Wanlock- head in Scotland. Felt 10 miles to E., and 3 or 4 to W.			Felt in the mines. A bed was shaken by the motion, which was attended with a hollow rumbling noise. The atmosphere was perfectly still before the shock.	Tilloch's Magazine, vol. lvi. p. 463; D. Milne's Catalogue of British Earthquakes.
11 <sup>h</sup> or 11 <sup>h</sup> 30 <sup>m</sup> P.M.	Ditto .....	Another shock .....			Ditto.
10 <sup>h</sup> (A.M.?).	Ditto .....	Ditto .....			Ditto.
Dec. 12. 4 A.M.	In the neighbourhood of Innsbruck.	A rather severe shock of some seconds' duration.			Moniteur, 25 et 27 Déc.
About the middle of the month.	In Upper Bavaria, and the northern part of the Tyrol.	A rather severe shock .....		Probably the same with the last account .....	Ann. de Chim. et de Phys. t. xv. p. 423.
— 22.	In the Peloponnesus ...	Trembling .....			Springs of boiling water came out of the earth Soutzo, Hist. de la Révolution Grecque, Paris, 1829, p. 52. Tilloch's Magazine, vol. lvi. p. 147.
— 25.	Kintail, Loch Earne, &c., in Scotland.	There seemed to be three shocks, of which the first was vertical, the second undulatory, and the			Journ. de Phys. t. xcii. p. 466; Ann. de Chim. et de Phys. t. xviii. p. 413; Moniteur, 15 Fév. 1821; Gilbert's Annalen, B. lxx. S. 330.
At night.	In the Morea and Ionian Isles, especially in Zante; including a cir- cuit of about 250 leagues.			The weather had been stormy for some days be- fore. At 4 <sup>h</sup> 10 <sup>m</sup> A.M. there was an extraordi- nary gust of wind, which suddenly ceased, it became calm, and soon after the earthquake occurred. The shocks were succeeded by	
About 5 A.M.					

1820, Dec. 29.	Island of Celebes	A severe shock	The sea rose several times to an unusual height, and carried away many houses.	Five days after the earthquake. Three or four minutes before the first shock a very large igneous meteor (apparently 4 to 6 feet in diameter) was observed over the sea off Point Gerakas, and remained visible for five or six minutes. On the 30th a luminous meteor described a vast parabola over the town, and fell into the sea. Numbers of houses were thrown down or injured in Zante, but only four men were killed.	Leonhard's Taschenb. für Mineralog. Jahrg. 18. S. 724; Quart. Journ. Roy. Inst. vol. xii. p. 427.
—	Coquimbo	—	—	The town was nearly destroyed, but the shock was local, and produced no alarm in other parts of the country.	Quart. Journ. Roy. Inst. vol. xvii. p. 39.
1821, Jan.	In Portugal	Earthquake shocks, said by some to have been felt at this time, others however denying the fact.	—	Terrible storms	Moniteur, 9, 10, 11, 12, et 13 Fév.
—	Island of Celebes, especially at Boeloe Comba.	More shocks	—	—	—
—	6. Zante and in the Morea	Several shocks. Much lighter than the former ones; lasted about 80 seconds, apparently in the same direction as before.	On the 9th January the water of the Aegean Sea, a part of the Gulf of Corinth, rose suddenly, inundating the country, and carrying away houses.	Much damage done in the villages. The town of Sala in the Morea was almost entirely destroyed by these shocks and those of December, numbers of people perishing beneath the ruins.	Revue Encycl. 1822, Juin; Archiv. des Découv. 1822, p. 193; Quart. Journ. Roy. Inst. vol. xii. p. 427. Ann. de Chim. et de Phys. t. xviii. p. 413; Moniteur, 9 Avril; Journ. de Phys. t. xxi. p. 466; Souton, Hist. de la Rév. Grecque, p. 52.
—	15. Berne	A strong shock	—	The Archives des Découvertes (1822, p. 189) gives the date January 14.	Ann. de Chim. et de Phys. t. xviii. p. 414; M. Studer's Catalogue. Ann. de Chim. et de Phys. t. xviii. p. 414; Archiv. des Découv. 1822, p. 189.
—	29. Kieff in Russia.	Rather severe shocks from E. to W.	—	—	—



1.	2.	3.	4.	5.	6.
1821. Feb. 4. Bergen in Norway ..... About 1 <sup>st</sup> 30 <sup>m</sup> A.M.		Rather severe shock followed by another of a minute's duration at half an hour after noon, and at 8 P.M. by two others with an interval of three or six minutes, the first of which was the most considerable, but was nevertheless slighter than that at 12 <sup>h</sup> . Apparent direction N. to S.			Rigstidenden, 1821, No. 15 and 30; Ann. de Chim. et de Phys. <i>loc. cit.</i> ; Archiv. des Découv. 1822, p. 190.
8 P.M.	Voss in Norway .....	Two shocks, of which the first was the stronger.			Ditto.
7 <sup>th</sup> 30 <sup>m</sup> P.M.	6. Ditto .....	A feeble shock .....			Keilhan.
2 A.M.	10. Jassy in Moldavia .....	A perceptible earthquake.			The Mém. de Chronol. (t. ii. p. 935) gives the date February 3-4 for this event, which is said to have been very remarkable, and to have been followed by other shocks in Moldavia in July, August, and September.
	Kieff in Russia. Also felt at Dubossar.	A shock lasting fifteen seconds at Kieff. Direction E. to W.			Probably only the same event with that reported Ditto. on the 29th of January.
3 <sup>rd</sup> 30 <sup>m</sup> P.M.	22. Voss in Norway .....	A very severe shock. The shocks observed at this place appeared to pass from W. to E.			Keilhan.
End of the month.	Quebec in Canada .....	A slight shock.			Ann. de Chim. et de Phys. <i>loc. cit.</i> ; Archiv. des Découv. 1822, p. 190.
	In Kamtschatka .....	Many severe and long-			Preceding a violent eruption of the volcano St. Peterab. Zeitschrift, 1825, März,

1821. Mar. 5. 5 A.M.	Island of Martinique	Several shocks	.....	The Archives des Découv. gives the hour 3 A.M.	Ann. de Chim. et de Phys. <i>loc. cit.</i> ; Archiv. des Découv. 1822, p. 190.
— 9.	Island of Bourbon	A shock of but short duration.	.....	During a violent eruption of the volcano on this island, which began on the 27th of February. The Archiv. des Découv. gives the date of the shock March 19.	Ann. de Chim. et de Phys. t. xxxiii. p. 404.
— 22.	Rieti in the States of the Church.	An extremely severe shock.	.....	At the moment of the shock a column of fire was seen to rise from the Fiume-di-Canera, which passed over the town, and seemed to fall into the lake of Cantelepe.	Ann. de Chim. et de Phys. <i>loc. cit.</i> ; Journ. des Débats, 21 Avril.
— April 8. 2 <sup>h</sup> 30 <sup>m</sup> P.M.	Meilla in the kingdom of Fez.	A severe shock, followed by other slighter ones.	.....	Accompanied by noise of extraordinary intensity	Ann. de Chim. et de Phys. <i>loc. cit.</i>
— May 9. June 8. 5 A.M.	Lunrøe in Norway Island of Martinique	A feeble shock An earthquake	.....	Following a sudden gale of wind, one of those there called "Grains."	Keilhau. Ann. de Chim. et de Phys. t. xviii. p. 414; Arch. des Découv. 1822, p. 190.
— 25. Between 7 and 8 P.M.	In the county of Cork, Ireland.	"Subterranean motion." The shocks were numerous and violent.	.....	Fields were converted into marshes or quagmires	Journ. des Débats, 26 et 29 Juillet.
— July 25. Aug. 2. 3 <sup>h</sup> 30 <sup>m</sup> A.M.	Lunrøe in Norway Naples	Another slight shock A slight shock. Apparently in the direction of the meridian.	.....	.....	Keilhau. Ann. de Chim. et de Phys. t. xviii. p. 414; Tenore, Géogr. Phys. et Botan. du Royaume de Naples, p. 93.
— 3.	Argelès and Lourdes in the departm. Hautes-Pyrénées.	A slight shock.	.....	.....	Ann. de Chim. et de Phys. t. xviii. p. 414; Archiv. des Découv. 1822, p. 190.
— 20. or 26.	St. Thomas and St. Croix in the West Indies.	Several shocks. Others were felt for some days before.	.....	About the 20th a fire-ball was seen, the crackling of which could be heard. It vanished without explosion.	Leonhard's Taschenb. für Mineralogie, Jahrg. 18. Abtheilung 3. S. 225; Gilbert's Annalen, B. lxi. S. 223.
— Sept. 1.	Catanzaro in Calabria.	Frequent shocks	.....	.....	Ann. de Chim. et de Phys. t. xxxiii. p. 405.
— 15. 10	Lunrøe in Norway	A slight shock.	.....	.....	Keilhau.
— 12.	Ditto	Ditto	.....	.....	Ditto.
— 17.	Jassy in Moldavia	Another shock	.....	Did much damage to buildings	Ann. de Chim. et de Phys. <i>loc. cit.</i>
— 20.	Konitz near Berne	A trembling	.....	.....	M. Studer's Catalogue.

1.	2.	3.	4.	5.	6.
1821, Sept. 23, 3 P.M.	Albano and Frascati in Italy.	One shock			Ann. de Chim. et de Phys. loc. cit.
— Oct. 6 & 7, several preceding days.	District of Giostra in Calabria.	Continuous shocks, of which some were very violent.		The town of Catanzaro especially suffered	Gilbert's Annalen, B. lxi. S. 223.
— 7.	Epinal, Remiremont, and Plombière, in the department of Vosges.	Several shocks from S. to N., lasting thirty seconds.		"Bruit semblable à celui que font entendre, quand elles tournent avec rapidité ces sphères creuses et percées d'un trou que les enfants appellent des <i>Diablos</i> ."	Ann. de Chim. et de Phys. t. xxi. p. 393.
— 8.	District of Orliuela, kingdom of Murcia, Spain.	Commencement of shocks, which lasted twenty-six days.			Ann. de Chim. et de Phys. t. xlv. p. 396; Féruasac, Bull. des Sc. Math. Janv. 1831, p. 36.
— 9 or 10.	Strathearn, a few miles east of Crieff, Scotland.			The noise resembled that of a mail-coach on a bad road. A person felt the ground move under his feet, as if it had been a piece of moving bog.	D. Milne's Catalogue of British Earthquakes.
— 11 to 14.	Sienna in Tuscany	Eight or ten shocks daily for this time. Direction = W. to E.		The shocks were constantly felt about midnight and at sunrise.	Gilbert's Annalen, loc. cit.; Ann. de Chim. et de Phys. t. xxxiii. p. 405.
— 15.	Island of Bute, Rothsay, Scotland.	Slight undulatory motion, lasting a few seconds.			Tilloch's Magazine, vol. lviii. p. 458.
— 17.	Sienna in Tuscany	Several shocks, the most severe of which occurred at 8 A.M.			Ann. de Chim. et de Phys. loc. cit.
— 18.	Ditto	Five shocks			Ditto; Gilbert's Annalen, loc. cit.
At night.					
— 22.	Comrie, Crieff, Loch Earn, Inverary, and at Down, thirteen miles down Loch Fyne, Scotland.	A vibratory shock		Accompanied by noise like that of several carriages in motion. Thunder and lightning at same time.	D. Milne's Catalogue; Ann. de Chim. et de Phys. t. xxi. p. 393; Edinburgh Philos. Journ. vol. vi. p. 191.
— 24.	Sienna in Tuscany	The last of the shocks, felt about this time.		Followed on the 25th by a thunderstorm	Ann. de Chim. et de Phys. t. xxxiii. p. 405; Gilbert's Annalen, loc. cit.
In the morning.					
— 28.	In Upper Saxony, extending as far as Krotzenburg (between Scheibenberg and Schwartz-	One or two undulatory shocks, lasting 15 seconds, or according to some, 2 mi-		A noise was heard like that of three or four carriages rolling after each other, and some people spoke of luminous phenomena seen at the same time. A thick fog prevailed on this day,	Ann. de Chim. et de Phys. t. xviii. p. 414; Gilbert's Annalen, B. lxi. S. 320, 325, 435.

	enberg) on the S. Eitritsch near Leipzig on the N., Mitweida on the E., and Etzdorf near Eisenberg on the W. The principal axis of disturbance seems to have run S.E. and N.W., at right angles to the chain of the Erzgebirge.	nutes.		as well as on those preceding and succeeding. The shock was especially strong on the line between Penig and Wechaelburg; and at some places in the area mentioned, as at Zwickau, Chemnitz, and Borna, was not felt at all.
1821. Oct. 29. In the evening. 1 P.M.	Glasgow, Greenock, &c. in Scotland.	A vibration		On the same day an unusually thick fog prevailed in London.
30.	Annaberg and Schwarzenberg in the Erzgebirge, Saxony.	Vibratory motion, lasting three to five minutes, in the direction E. to W.		Ditto, S. 329.
Nov. 17. 2 <sup>nd</sup> 50 <sup>th</sup> P.M.	Lemberg in Galicia	Slight shocks, lasting some seconds.		Ditto, S. 329 u. 435; Féruassac, Bull. des Sc. Nat. t. xvii. p. 343.
3 <sup>rd</sup> 45 <sup>th</sup> P.M. and in some places as late as 4 P.M.	Kieff in Podolia, the other southern governments of the Russian Empire, Jassy in Moldavia, and as far as Tiflis in Georgia.	Three strong shocks		At Jassy some damage was done to buildings; but were in Kieff the shocks were but slight, but were stronger at Olgoropol, Uman, Dubossar (in the government of Cherson), Machnowska, Nikolajew, and Otchakow.
2 A.M. At Naples 2 <sup>nd</sup> 15 <sup>th</sup> .	In the provinces of Capitanata and Molise, kingdom of Naples, particularly at Tremoli and Porto-Cannone. Felt but feebly at Naples.	A strong shock from E. to W., followed, rather slowly, by seven others.		A luminous meteor moving in the same direction as that taken by the shock was observed just before. At Tremiti and elsewhere some damage was done to buildings, &c. The autumn had been dry, and since the middle of October, cold. On the 5th November there was a violent storm.
27. 8 A.M.	Leadhills and Wanlockhead, Scotland.	A slight shock, followed, at 11 P.M., by another shock, unaccompanied by trembling motion.		Accompanied by a hollow rumbling noise, heard distinctly by the miners at a depth of 150 fathoms. The noise was still louder on the occurrence of the second shock.
29.	Odessa	Vibratory. Lasting about forty seconds.	The sea rose higher than usual.	Probably only the same event with that of the 17th, the difference of style accounting for the different dates.

Gilbert's Annalen, B. lix. S. 436; Tenore, *loc. cit.* p. 93; Ann. de Chim. et de Phys. t. xxiii. p. 405; Journ. des Débats, 13 et 27 Déc.

D. Milne's Catalogue.

Gilbert's Annalen, *loc. cit.* S. 329; Ann. de Chim. et de Phys. t. xxiii. p. 405.

2.	3.	4.	5.	6.
ec. 16. Prague ..... M. or	Several considerable shocks.			Gilbert's Annalen, <i>loc. cit.</i> S. 436.
— 20. In Iceland .....	The earth trembled strongly.		During the violent eruption of the volcano Eyafjelds-Jökull, which began on the 19th, continued with great violence for many days, and had not ceased on the 28th of February, 1822. On the 25th of December there was a violent storm from the south, and on the 26th and 27th from the north-east; accompanied by an unusually low state of the barometer, observed over a great part of Europe. Preceded by the appearance of several luminous meteors.	Ann. de Chim. et de Phys. t. xxxi. p. 397; Journ. des Débat, 8 et 9 Avril, 1822; Edinb. Philos. Journ. vol. vii. p. 153, &c.
— 24. Rhintal (Rheinthal ?), A shock ..... Switzerland.	A shock .....		On the same day a violent tempest raged at Genoa, in Upper Italy, and in Switzerland. A remarkable fall of the barometer was also observed over almost the whole of Europe.	Ann. de Chim. et de Phys. t. xxxiii. p. 403. Ditto, t. xxi. p. 393; Edinb. Philos. Journ. vol. vii. p. 153.
— 25. Mayence ..... P.M.	A slight shock.....			Ann. de Chim. et de Phys. t. xxxiii. p. 405.
— 26. On the coast of the Adriatic (east or west coast ?). Bima in the island of Sumbava, principally under the sea.	Two strong shocks ..... At Bima the shocks occurred at regular intervals of five or six minutes.	The earthquake under the sea off Bima was tremendous, ships being carried by the "sea-wave" inland even over houses. The motion extended to the coasts of Celebes and Macassar.	At the same time with the shocks a submarine volcano near Bima threw out burning stones, ashes, and thick smoke.	Reinwardt in Magaz. voor Wetensch. Konst en Lett. p. v. H. I. p. 71.
m. 9. At Naples ..... 8 P.M.	A slight vibratory shock from E. to W.			Tenore, <i>loc. cit.</i> p. 94.
— 19. Salerno in Italy .....	Two slight shocks, one in the day, and one at night.		On the 13th of February an eruption of Vesuvius began, which ceased on the 25th; though ashes continued to be thrown forth almost the whole summer through, and the eruption recommenced with great violence on the 1st of	Ann. de Chim. et de Phys. t. xxxiii. p. 405, t. xxi. p. 398.

1822. Jan. 26. Komarom in Hungary...	.....	.....	.....	.....	Férussac, Bull. des Sc. Nat. t. xviii. p. 195, quoting from Michael Holeczy, Tudományos Gyűjtemény, 1824, Nr. v. p. 56-61.
— Feb. 6. Ditto .....	.....	.....	.....	.....	Ditto.
— 8. Landshut in Bavaria ...	.....	.....	.....	.....	Ann. de Chim. et de Phys. t. xxi. p. 393.
— 15. Halland in Sweden .....	.....	.....	.....	.....	Ditto, t. xxxiii. p. 405.
— 18. Komorn in Hungary ...	.....	.....	.....	.....	Ditto.
— 19. In France and Switzerland. At Paris the direction is said to have been that of the magnetic meridian, as observed by the motion given to a magnetic needle, or S.E. to N.N.W. At Geneva the horizontal oscillation felt in the upper stories was from N.E. to S.W. At Seyssel and Belley the shock was very strong, and lasted twelve or fifteen seconds.	.....	.....	.....	.....	At Belley rocks were split by the shock. At Aix the hot springs were troubled, and lost their taste and smell. At Chambéry many old walls were cracked. At Geneva a dull noise like the rolling of wagons was heard. The barometer, which before was high, rose slowly all the forenoon. For Arago's account of the disturbance of the magnetic needle at Paris, vid. Ann. de Chim. et de Phys. t. xix. p. 106.
— 22. Komarom in Hungary...	.....	.....	.....	.....	Férussac, loc. cit.
— 23. Ditto .....	.....	.....	.....	.....	Ditto.
— 3 <sup>h</sup> 35 <sup>m</sup> P.M. Belley in the departm. de l'Ain. Also felt at Chambéry.	.....	.....	.....	.....	Journ. des Débats, 5 Mars; Ann. de Chim. et de Phys. t. xxi. p. 393; M. Perrey's Memoir on Earthquakes in France, Belgium, and Holland.
— 24. Komarom in Hungary...	.....	.....	.....	.....	Férussac, loc. cit.
— 26. Ditto .....	.....	.....	.....	.....	Ditto.

	2.	3.	4.	5.	6.
Feb. 27. Komarom in Hungary...					Féussac, <i>loc. cit.</i>
— 28. Ditto .....					Ditto.
— March 1. Ditto .....					Ditto.
— 3. Ditto .....					Ditto.
— Basano in Italy .....		A slight shock			Ann. de Chim. et de Phys. t. xxxiii. p. 405.
— P.M. .....					Gentleman's Magazine, vol. xcii. pt. 1. p. 365.
— 20. Several villages near York.				Attended with a rumbling noise	L. Stulli, Sulle Detonazione dell'isola di Meleda, Ragusa, 1823; Paul Partisch, Bericht über das Detonations Phänomen auf der Insel Meleda bei Ragusa, Wien, 1826.
— "ording ers, the r 21st l.		Commencement of the noises heard at this place, but which do not seem to have been accompanied by any true earthquake shocks, or, at least, any such felt were extremely slight.	On the 22nd a submarine eruption was supposed to have occurred near Marsala in Sicily. Journ. des Débats, 23 Avril.	The noises were heard at the following periods:— March, April, May, June, July and August, 1822; March, April, July, August, September, October, and November, 1823; January, March, April, May, August, September, October, November, and December, 1824; January and February, 1825.	
— April 5. Country around Etna ...		Several shocks		Accompanying the commencement of an eruption. Subterranean explosions were heard.	Ferrara, Edinburgh Journal of Science, Nrs. 7 and 8.
— 6. Ditto; especially the towns of Nicosia, Capizzi, Cesaro, Sperlinga, Troina, Gangi, and Gagliano. The centre seemed to be Nicosia.		Severe shocks		The eruption did not cease until October.	Ditto; Ann. de Chim. et de Phys. t. xxxiii. p. 405.
— 8. Komarom in Hungary...					Féussac, <i>loc. cit.</i>
— 10. Nicosia and the towns near Etna.		Another shock, more violent than those of the 6th.		A violent clap of thunder was heard while the sky was quite clear.	Ferrara, &c. as quoted above.
— 13. Comrie in Perthshire ...		The most violent shock felt for twenty years.		Accompanied by two loud reports, the one over head, and the other, immediately after, apparently under foot. The noise lasted thirty seconds, and was louder than any thunder.	Milne's Catalogue; Ann. de Chim. et de Phys. t. xxxiii. p. 406.
— 18. Catania in Sicily .....		Slight shock			Ann. de Chim. et de Phys. <i>loc. cit.</i>
— 19. Ditto .....		Ditto			Ditto.
— (A.M. ...)					

1822, Apr. 22, 9 <sup>h</sup> 30 <sup>m</sup> A.M.	Dunkeld in Scotland				D. Milne's Catalogue.
— 23. Komarom in Hungary					Férussac, <i>loc. cit.</i>
— May 3. Ditto					Ditto.
— 4. Lunrøe in Norway					Keilhan.
— 6. Sicily					Hesperus, 1823, Nr. 173.
— 7. Carthago in the province of Costa-Rica, Central America, 9° 30' N. lat.					Journ. de Frankfort, 1823, Nr. 39.
11 P.M.					The town was quite ruined
— 8. Island of Cuba					Ann. de Chim. et de Phys. t. xxxiii. p. 406.
At night.					Hesperus, 1823, Nr. 173.
— Sicily					Keilhan.
— Lunrøe in Norway					Journ. des Débats, 10 Juin.
— 9. Czernowitz in Galicia					Accompanied by a noise like thunder
6 <sup>h</sup> 58 <sup>m</sup> A.M.					
— Sicily					Hesperus, 1823, Nr. 173.
— 10. Ditto					Ditto.
— 18. Crief and the neighbourhood, Scotland.					Ann. de Chim. et de Phys. <i>loc. cit.</i>
Between 9 and 10 A.M.					
— 22. Komarom in Hungary					Férussac, <i>loc. cit.</i>
— 31. In France, at Cognac, Angers, and Tours, and more feebly at Bourbon-Vendée, Laval, and Nantes. Perceived at Paris by the motion of the magnetic needle.					At Bourbon-Vendée a dull noise was heard like the rolling of a heavily-laden wagon over an uneven road.
8 A.M. At Cognac between 7 & 8, at Nantes at 7 <sup>h</sup> 53 <sup>m</sup> , at Rennes at 7 <sup>h</sup> 55 <sup>m</sup> at Tours and Bourbon-Vendée at 7 <sup>h</sup> 35 <sup>m</sup> , 2 <sup>m</sup> at Laval					Ann. de Chim. et de Phys. t. xxi. p. 393 et 403.
at 8 <sup>h</sup> June 16, at 15 <sup>m</sup> , and 4 <sup>h</sup> 30 <sup>m</sup> P.M.					Immediately after the shocks a luminous meteor was observed, which seemed to rise from the Bay of Mont-St.-Michel to the south, and was followed by a loud explosion. Torrents of rain fell the same day in the whole department de la Manche, and a waterspout passed over it.



2.	3.	4.	5.	6.
— 29. Komarom in Hungary...				Férussac, <i>loc. cit.</i>
— 1. Ditto .....				Ditto.
— 6. Lisbon.....	A violent shock, lasting 6 or 7 seconds. The oscillation was rather vertical than horizontal.		The Archives des Découvertes gives the date July 10.	Ann. de Chim. et de Phys. t. xxi. p. 393.
— 10. Ancona .....			Accompanied by loud explosive noise. On the 11th at dawn an eruption of Vesuvius began.	Ditto, t. xxxiii. p. 405.
— 14. Catanzaro in Calabria...	A rather severe shock.			Ditto.
— 15. Komarom in Hungary...			On the 23rd, at 6 A.M., a violent eruption of the volcano Gunung-Ber-Api in Sumatra.	Férussac, <i>loc. cit.</i>
— 22. Ditto .....			Ditto.	Ditto.
— 25. Ditto .....	A slight vibration			Journ. des Débats, 9 Août; Ann. de Chim. et de Phys. t. xxi. p. 393.
— 28. In several quarters in Madrid.	A violent earthquake; the shocks were renewed on the following night.		Many buildings were injured, among others the tower of the cathedral.	Archiv. des Découv. 1823, p. 187.
— 29. Granada in Spain .....	A slight shock			Ann. de Chim. et de Phys. t. xxxiii. p. 405.
— 30. Catanzaro in Calabria...				Ditto, t. xxi. p. 393; Archiv. des Découv. 1823, p. 188.
— 1. Island of Martinique ...	Ditto. None had been felt for two years before.			Ann. de Chim. et de Phys. t. xxxiii. p. 406.
— 8. Laybach in Carinthia ...	A rather severe shock.			Ditto, t. xxi. p. 393; Journ. des Débats et Moniteur, 11, 12 et 13 Nov.
— 10. Tomsok in Siberia .....	A violent shock from N. to S., lasting one minute.			Férussac, <i>loc. cit.</i>
— 9. Komarom in Hungary...	Beginning of the shocks.			Ann. de Chim. et de Phys. t. xxi. p. 393, et t. xxx. p. 433; Moniteur, 5 Oct., 13 Nov., 1 Janv.; Journ. des Débats, 2, 4 Oct., 23 Nov. et 31 Déc.; Vernier, Journ. des Voyages, t. xvi. pp. 6 et 395.
— 10. Aleppo .....				

1822. Aug. 12. 8 P.M.	Komarom in Hungary Aleppo. Also felt at Beyrout and Alexandria.	A violent earthquake. The worst shocks were at 8 <sup>h</sup> 30 <sup>m</sup> , but they recurred more or less every quar- ter of an hour up to noon on the 14th. On the 15th and 16th there were others, and some occurred almost every day during a month.	Between Alexandria and Cyprus, in long. 28° 35' E. (from Paris), and lat. 34° 28' N., a rock ap- pears to have risen from the sea.	Accompanied by subterranean noise, which in- creased up to 8 <sup>h</sup> P.M. A large part (two- thirds) of the town was destroyed, and several thousand of the inhabitants perished beneath the ruins. Antioch, Latakiah, Djeir, and other towns within a radius of 50 leagues, were also much injured. The weather had been very hot and close at Aleppo.	Férussac, <i>loc. cit.</i> Ann. de Chim. et de Phys. &c., as just quoted.
— 21. — 22. — 25. — 28. 10 <sup>h</sup> 40 <sup>m</sup> A.M. — 29. 3 <sup>h</sup> 45 <sup>m</sup> (Italian time?) 1 P.M.	Komarom in Hungary Ditto Ditto Venice Ditto	Slight shocks Ditto			Férussac, <i>loc. cit.</i> Ditto. Ditto. Ann. de Chim. et de Phys. t. xxxiii. p. 405; Journ. des Débats, 17 Sept. Ditto.
— 30. Sept. 4. 8 <sup>h</sup> 55 <sup>m</sup> A.M.	Agram in Croatia Port of Spain, island of Trinidad. Aleppo	Vibratory shock, last- ing five seconds. A rather violent earth- quake. More shocks		The shock was more perceptible in the moun- tains which surround the town from W. to N. Accompanied by subterranean noise like thunder. Destroyed what had resisted the former earth- quake. More than 20,000 persons are said to have lost their lives by these shocks, which were felt in several other towns, at Damascus, and in the island of Cyprus. Preceded by a noise like that of a cannon, and accompanied by the appearance of a number of very brilliant shooting stars. Aérolites said to have been found in various places.	Journ. des Débats, 17 Sept. Moniteur, 23 Oct. Authorities quoted under Aug. 10.
— 10. 11 <sup>h</sup> 30 <sup>m</sup> P.M.	Karlstadt in Werneland, Sweden. Felt as far as the extremities of the province.	A strong earthquake shock, from E. to W.			Ann. de Chim. et de Phys. t. xxi. p. 393; Moniteur et Journ. des Débats, 11 Oct.; Kefenstein.
— 13. — 18. Between and 2 P.M.	Komarom in Hungary Dunston near New- castle-on-Tyne.	A severe shock		Accompanied by a loud noise like distant thun- der.	Férussac, <i>loc. cit.</i> Quart. Journ. Roy. Inst. vol. xiv. p. 450; Ann. de Chim. et de Phys. t. xxi. p. 393; Journ. des Débats, 12 Nov.; Moniteur, 13 Nov.

	2.	3.	4.	5.	6.
Sept. 29. 7 A.M.	Cadiz. Also felt at Algesiras and Cordova.	A strong shock from E. to W., lasting nearly 2 seconds.			Ann. de Chim. et de Phys. loc. cit.; Journ. des Débats, 15 Oct.
—	Aleppo	Several more shocks.			Ann. de Chim. et de Phys. t. xxxiii. p. 406; Journ. des Débats, 16 Déc.; Moniteur, 17 Déc.
— 30. Ditto		Ditto			Ditto.
— 31. Four of eight.	Between the volcanos Gunung-Ber-Api and Gunung-Tallang, in the province of Menangkabon, island of Sumatra.	The shocks were felt hourly during 24 hours.		Accompanied by subterranean noise, which sometimes seemed to come from the one volcano, and sometimes from the other. Tallang gave forth smoke, but no eruption had been known to occur for a long time.	Asiatic Journal, 1826, May, p. 577.
Oct. 1.	Mies in Bohemia and neighbourhood.	A very distinct shock.		On the 8th there was a most violent eruption of the volcano of Galong (or Galung Gunung) in the island of Java.	Froriep's Notizen, &c. B. iii. No. 58.
— 8. In Murcia, Spain		Several shocks		Some motion of the earth gave notice of an eruption which began on the 22nd, at 2 p.m.	V. Hoff.
— 18. Country around Vesuvius; at Naples.				The shower of ashes ceased on the 25th, and the last appearance of smoke was seen on the 4th November. Stromboli and Vulcano also showed unusual signs of activity.	Wiener Zeitung, 1823, Mai, S. 529; Geist der Zeit. Jul. 1823, S. 123; Pérussac, Bull. des Sc. Nat. t. i. 1824, p. 115; Moniteur, 10 Nov.; Journ. des Débats, 12 Nov.
Nov. 1.	Norrdelge and all the northern coast of the Baltic.	A slight shock		Accompanied by rolling noise	Keferstein, p. 342; Keilbau.
— 4. Copiapo in Chili		A severe shock		Many houses injured	Quart. Journ. Roy. Inst. vol. xvii. p. 39.
— 5. Ditto, and at Coquimbo.		A much more violent earthquake.		Copiapo was nearly destroyed, and Coquimbo also suffered considerable injury.	Ditto.
— Komarom in Hungary					Pérussac, Bull. des Sc. Nat. t. xviii. p. 195.
— Aleppo		Severe shocks felt almost daily. On the night of the 12th a very violent one.			Ann. de Chim. et de Phys. t. xxi. p. 393; Moniteur, 16 Fév. 1823.

<p>1822, Nov. 19. In Chili. Felt as far south as Concepcion, and eastward of the Andes at Mendoza and St. Juan. The centre of disturbance was probably about 15 miles N.E. of Valparaiso.</p>	<p>Very violent shocks, lasting 3 minutes. A few minutes later the earthquake recommenced, and from this time almost the whole night, two or three every five minutes, each lasting half a minute or a minute. The first three shocks were by far the most severe. During the violent shocks it seemed as if the earth were raised up and moved from N. to S., and then sank again, but occasionally a movement at right angles to this was also felt. At Santiago and Valdivia the earthquake was less severe. To the N. of Valparaiso the shocks seemed to come from the S.W., while S. of that place they appeared to be from the N.W. Shocks were felt occasionally up to the end of Sept. 1823.</p>	<p>The effect seemed to people on board the ships in the harbour of Valparaiso, as if they were rapidly forced through the water and then struck the ground. The sea here rose to an amazing height, and then retreated so far that all the small boats were left dry upon the strand. It continued rising and falling, though to a gradually diminished extent, for a quarter of an hour. The earthquake was also felt on board ships lying at Callao.</p>	<p>Trans. Geol. Soc. loc. cit.</p>
<p>1822, Nov. 19. In Chili. Felt as far south as Concepcion, and eastward of the Andes at Mendoza and St. Juan. The centre of disturbance was probably about 15 miles N.E. of Valparaiso.</p>	<p>The atmosphere was perfectly clear and fine, and the moon shone brightly. The shocks were accompanied by noise like the bursting forth of vapour. The greater part of the towns of Valparaiso, Melipilla, Quilotoa and Casablanca was ruined. In the morning the streams and lakes were found greatly swollen by the snow which had fallen from the mountains. The water of the lake Quintero, which is connected with the sea, was much lowered. In the valley of Vina la Mar the earth was covered with heaps of sand 3 or 4 feet high, which had been thrown up mixed with water from holes beneath. Cracks opened in the granite of the promontory of Quintero parallel to each other and to formerly existing and similar ones. Some examples of apparent vortice motion were recorded. In the mine of El Bronze de Peteroa and in several others the shocks were violently felt. The most remarkable concomitant of this earthquake was the permanent elevation of the land for more than 100 miles along the coast. At Valparaiso the elevation was about three feet, and at Quintero four. It seems probable that this coast had been several times before raised in the same way.</p>	<p>The day and night were hot and windy</p>	<p>Trans. Geol. Soc. loc. cit.</p>
<p>20. Ditto, and at Valparaiso</p>	<p>Three severe shocks; before 2 a.m., about</p>	<p>Three severe shocks; before 2 a.m., about</p>	<p>Trans. Geol. Soc. loc. cit.</p>

1.	2.	3.	4.	5.	6.
Nov. 21.	Chili, and at Valparaiso	4, and a quarter before 6 A.M. The earth trembled constantly between these shocks. At 2 <sup>h</sup> 30 <sup>m</sup> , 2 <sup>h</sup> 50 <sup>m</sup> , 7 <sup>h</sup> 45 <sup>m</sup> , 9 <sup>h</sup> 15 <sup>m</sup> , and 10 <sup>h</sup> 15 <sup>m</sup> A.M., and at 1 <sup>h</sup> 15 <sup>m</sup> and 2 P.M., severe shocks were felt.		The day and night were hot and windy	Trans. Geol. Soc. <i>loc. cit.</i>
—	Horb in Würtemberg	A shock			
— 22.	Valparaiso	At 4 <sup>h</sup> 30 <sup>m</sup> , 7 <sup>h</sup> 30 <sup>m</sup> , and 9 <sup>h</sup> 15 <sup>m</sup> A.M., strong shocks. A little before 10 A.M. three loud explosions, after each of which the earth trembled. At 11 A.M. another severe shock, and between this and 1 P.M. three weak ones. The earth then remained quiet until 7 <sup>h</sup> 30 <sup>m</sup> P.M.		On this day there was a thick fog with cold fine rain.	Hesperus, 1822, 3 Dec. Trans. Geol. Soc. <i>loc. cit.</i>
— 23.	Ditto	The shocks were slight, and at greater intervals than before.			Ditto.
— 24.	Ditto	The earth shook violently up to 11 P.M.			Ditto.
— 25.	Sulz in Würtemberg. Also felt at Altenseig and Heidelberg.	Two shocks		Accompanied by subterranean noise like thunder. v. Hoff gives the date Nov. 23.	Ann. de Chim. et de Phys. t. xxi. p. 393, t. xxxiii. p. 406; Moniteur, 8, 12, 13 Dec.; Journ. des Débats, 6 Dec.
—	Valparaiso	At 8 <sup>h</sup> 15 <sup>m</sup> A.M. a severe shock, followed by others till shortly			Trans. Geol. Soc. <i>loc. cit.</i>

1822. Nov. 26. Ditto	At 2 <sup>h</sup> 45 <sup>m</sup> A.M. a perceptible vibration, lasting nearly 2 min. From this time till the 18th Jan. 1823, shocks of more or less violence were daily felt. Those of the 10th and 25th December were the most severe.	On the evening of the 27th the country was visited by a tremendous storm of rain, accompanied by heavy gusts of wind, a meteorological phenomenon never before known to occur at this season; hence great terror was caused by it.	Ditto; Quart. Journ. Roy. Inst. vol. xvii. p. 44.
— 28. 10 <sup>h</sup> 50 <sup>m</sup> A.M.	Tübingen, Heidelberg, Straßburg, Kohl. Buol, Steinbach, Einzhelm, Carlsruhe, Spire, and Stuttgart.	Herr v. Yelin (at Munich?) believed that the magnetic needle was affected by this earthquake.	Ann. de Chim. et de Phys. &c., quoted for the 23th; Herschels, 1822, 3 Dec.; Schweigger, B. liii. (xxiii.) S. 49.
— About half-an-hour after midnight?	Mayence, especially on the bank of the Rhine.	Ditto.	Ditto.
— Dec. 1. Island of Grenada in the West Indies.	A violent earthquake.	Did great damage to buildings	Ann. de Chim. et de Phys. t. xxiv. p. 429; Archiv. des Découv. 1824, p. 210.
— 20. Ditto	More shocks	Enormous rocks were rolled down from the mountains.	Ditto.
— 24. Komarom in Hungary			Férussac, Bull. des Sc. Nat. t. xviii. p. 195.
— 27. Kadu in the island of Java.	Shocks, which continued for 30 hours.		Asiatic Journal, 1822, Dec.; Verneur, Journal des Voyages, t. xviii. p. 260; Férussac, Bull. des Sc. Nat. 1824, p. 328.
— 28. Ditto	A more violent shock felt.		Ditto.
— 1 <sup>h</sup> 30 <sup>m</sup> A.M.	The mountain Bromo, at Pasuruan in Java.	A shower of fine black ashes was thrown forth from this mountain. At the same time Merapi was in violent eruption. Four villages were burnt by the lava. The district of the island which had been convulsed on the 8th October, now remained perfectly quiet.	Ditto.
1823. Jan. 6.	Bergen in Norway		Kefenstein.
— 9.	Lunrøe in Norway		Keilhan.

2.	3.	4.	5.	6.
<p>10. Laurie in Norway .....  District of Orhuela in Murcia, Spain. The shocks were felt at Carthagena and Alicante.</p>	<p>Three shocks .....  More than 200 severe shocks in 24 hours.</p>		<p>Several houses fell .....</p>	<p>Keilhan.  Ann. de Chim. et de Phys. t. xlv. p. 396; Ferrussac, Bull. des Sc. Math. Janv. 1831, p. 36.</p>
<p>15. Santiago in Chili .....</p>	<p>Severe tremblings .....</p>			<p>Garnier, Météorologie, p. 136.</p>
<p>24. Laurie in Norway .....</p>	<p>One shock .....</p>		<p>Keilhan.</p>	<p>Keilhan.</p>
<p>25. Ditto .....</p>	<p>Two shocks .....</p>		<p>Ditto.</p>	<p>Ditto.</p>
<p>27. Ditto .....</p>	<p>One slight shock .....</p>		<p>Probably the same with the following .....</p>	<p>Ditto.</p>
<p>29. Norrdelge, a town to the east of Upsal in Sweden.</p>	<p>An earthquake .....</p>		<p>In Aland accompanied by a subterranean noise.</p>	<p>Ann. de Chim. et de Phys. t. xxiv. p. 429; Journ. des Débats, 17 Mars; Moniteur, 18 Mars; Poggendorff's Annalen, B. ix. S. 592.</p>
<p>30. Ditto, and in the island of Aland in the Baltic, 11 geographical miles from Norrdelge.</p>	<p>At Norrdelge two shocks. In Aland one violent one.</p>			<p>Ann. de Chim. et de Phys. t. xxiii. p. 406; Journ. des Débats, 17 Mars.</p>
<p>Rasipatz or Karipatz, a post station between St. Petersburg and Riga.</p>	<p>A rather severe shock, followed, it appears, by another in February.</p>			<p>Ann. de Chim. et de Phys. t. xxiii. p. 407.</p>
<p>In Chili .....</p>	<p>Six shocks .....</p>		<p>Perhaps the same with the earthquake mentioned on the 15th.</p>	<p>Ann. de Chim. et de Phys. t. xlii. p. 407.</p>
<p>9. Columbo in Ceylon. Also felt at Kandy, Ratnapora, Matura, and Negumbo.</p>	<p>In Ceylon two shocks in half-a-minute.</p>	<p>At 1<sup>h</sup> 10<sup>m</sup> p.m. the ship 'Winchelsea,' in lat. 1° 21' N., long. 85° 35' E., experienced a severe shock. The motion was tremulous, as if the vessel were passing over a coral reef. At the same time a loud rumbling noise was heard.</p>	<p>Accompanied by subterranean noise like that of a cannonade. The Quart. Journ. gives the position of the 'Winchelsea' as 52° N. lat., 83° 33' E. long., a manifest error. Before the shock an unusual oscillation of the barometer on board this ship, to the extent of .1 in., was observed. Since the afternoon of the 8th the mercury had fallen from 30.5 in. to 30 in. It rose again to its former level on the 11th. v. Hoff suggests a possible connexion between this earthquake and that in Moldavia on the 11th.</p>	<p>Ferrussac, Bull. des Sc. Nat. 1824, t. i. p. 326; Edinburgh Journal of Science, 1826, April, p. 264; Quart. Journ. Roy. Inst. vol. xvi. p. 184; Monthly Magazine, vol. lviii. p. 530; Edinburgh Journal of Science, vol. iv. p. 261.</p>

1823. Feb. 9. 6 <sup>h</sup> 50 <sup>m</sup> P.M. (At Jassy be- tween 6 & 7.)	Bucharest and Jassy in Moldavia.	Violent shocks	tion and noise con- tinued two or three minutes. No com- motion was visible in the water. At 1 <sup>h</sup> 15 <sup>m</sup> the ship 'Or- pheus,' in 1° N. lat., 84° 6' E. long., felt a shock as if the vessel had touched the bottom. A con- fused grinding tre- mulous noise was heard for 60 or 65 secs. No ground on sounding with 20 fathoms. The shock was suffi- ciently strong to throw one of the compasses out of its place. At 2 <sup>h</sup> 5 <sup>m</sup> in 1° 15' N. lat. and 84° 4' E. long., a second lighter shock was felt, and about 3 <sup>h</sup> a third, scarcely percepti- ble.	The earthquake is also reported as on the 10th at Jassy, but there is little doubt that the event is the same with that at Bucharest.	Ann. de Chim. et de Phys. t. xxiv. p. 429; Archiv. des Découv. 1824, p. 216.  Poggendorff's Annalen, B. xxiv. (c.) S. 34.  Ann. de Chim. et de Phys. t. xxxiii. p. 406.
— — — 16. Palermo		One shock			
— — — 19. 6 P.M. — — — Night between 24 and 25.	Belley in the depart. Ain. Salzgitter, near Hildes- heim near Hanover.	Very perceptible shocks. Some people believed that they felt mo- tion like that of an earthquake.		During a violent storm. The supposition that earthquake shocks were felt is somewhat con- firmed by the fact, that an opening of a foot in width was observed next morning in the	



2.	3.	4.	5.	6.
<p>b. 25. Lunrøe in Norway .....          — 27. Poggia, San Severino, &amp;c. in Apulia.          r. 2. Madras and in Ceylon....</p>	<p>Two shocks .....          Severe shocks .....          A severe shock, felt 20 minutes later at Travancore than at Madras.</p>		<p>street at the west end of the town, beneath which was a deep hollow. The opening gradually increased in width, but, by the falling in of earth, was closed below.</p>	<p>Keilhan.          Ann. de Chim. et de Phys. t. xxiv. p. 429; Montieur, 28 Mars.          Archiv. des Découv. 1824, p. 210; Ann. Reg.</p>
<p>— 5. In Sicily. Very violent shocks at Palermo. Several less severe shocks were felt from Cap-di-Orlando to Cap-di-Calava. At Catania, Syracuse, and Trapani, and in general in the interior and south of the island, but little motion was perceived. At Alcamo, however, eight leagues to the E. of Trapani, the shock was very strong. At Stromboli and Lipari the earthquake was very violent, and the centre of disturbance was probably about here.</p>	<p>Very violent. Five shocks at Palermo, lasting together 16 or 17 secs. Direction N.E. to S.W. The first shock was indistinct, but tending from below upwards; the second was more severe, and undulatory; the third less strong, but of the same nature; the fourth was on the whole equal to the second; and the fifth, like the first, had an evident tendency upwards. At Caltanissetta five shocks, from N.E. to S.W., were felt in 9 secs. At Terrapilata the direction was S.E.</p>	<p>At Cefalu, 48 miles from Palermo, the waters of the sea came in in two successive waves of enormous size, and destroyed a building.</p>	<p>At Palermo the water in the great basin of the botanical garden was raised up in the direction of S.W., and the mercury in the seismometer at the Observatory was put into violent motion, so that at the fifth shock it seemed as if boiling. The spear of a vane on the palace bowed to the S.W. at an angle of 20°, and remained so until the 9th, when it fell. A palm-tree, 30 feet high, was seen to bow its branches alternately to N.E. and S.W., almost to the ground. The clocks of the Observatory which vibrated from N. to S. and from E. to W. were stopped, and the actuating weight of one of them broke its crystal. Two small clocks vibrating in the direction of the shock were not stopped. Great damage was done at Roccapalombo, Pozzillo, S. Agata, Isnello, Castelbuono, &amp;c., and especially at Naso. The warm springs of Termini were troubled. At Terrapilata clefts of 10 to 18 in. wide opened, and an eruption of mud and gas took place from the two mud volcanoes. At Palermo the following night was stormy, with rain, thunder, snow, and hail.</p>	<p>Silliman's Journal, vol. ix. p. 216; Ann. de Chim. et de Phys. t. xxiv. p. 429; Montieur, 28 Mars et 28 Déc.; Journ. des Débat, 31 Mars et 1 Avril; Ferrussac, Bull. des Sc. Nat. t. iv. pp. 7-9, t. v. p. 406, t. xiii. p. 33; Ferrara, Memoria sopra i tremuoti della Sicilia in Marzo 1823, Palermo, 1825; Edinb. Journal of Science, no. vii. p. 155, no. viii. p. 362.</p>

1823. Mar. 6. 1 <sup>h</sup> 45 <sup>m</sup> A.M.	St <sup>a</sup> Lucia-di-Milazzo in Sicily, 6 miles from the shore. Also felt at Mesaina, but not at Palermo.	Violent shocks, recurring four times.	was felt as might be in the direction of Stromboli and Vulcano, not perceived at Palermo.	Accompanied by terrible noise	Ditto.
— 7. 10 <sup>h</sup> 56 <sup>m</sup> P.M.	Palermo	Another shock, from N.E. to S.W.			Ditto.
— 9.	In North-Eastern India, especially in the Neilgherry mountains. Also felt at Madras, though with less violence.				Asiatic Journal, 1823, Oct. p. 376; Férussac, Bull. des Sc. Nat. 1824, t. i. p. 326.
— —	San Severino in Italy	A slight shock			Ann. de Chim. et de Phys. t. xxxiii. p. 406.
— 10.	Ditto	Ditto			Ditto.
— 11.	Ditto	Ditto			Ditto.
— 19.	Lunrøe in Norway	Two shocks			Kalhan.
— 24.	Ditto	Two more strong shocks.			Ditto.
— 26.	Palermo	Some more slight shocks.			Ferrara's memoir above quoted.
— 27.	Island of Favignana, near Trapani, Sicily.	Strong trembling		Part of an ancient fortress fell, and twenty-two persons perished.	Ann. de Chim. et de Phys. loc. cit.
— 31.	Messina	Slight vibratory shock.			Ditto; Ferrara, loc. cit.
2 <sup>d</sup> 52 <sup>m</sup> P.M.					Ferrara, loc. cit.
April 1.	Castel-Buono in Sicily	Another shock			Garnier, Météorologie, p. 137.
— 3.	Calcutta	Shocks from N. to S., and vice versa, up to 11 <sup>h</sup> .			
10 P.M.					Ditto.
— 22.	Island of Penang, Straits of Malacca.	Two shocks			
3 <sup>d</sup> 3 <sup>m</sup> A.M.					Ann. de Chim. et de Phys. t. xiv. p. 429; Archiv. des Découv. 1824, p. 211.
— 28.	Island of Martinique	A single shock			Kalhan.
3 <sup>d</sup> 45 <sup>m</sup> A.M.					
May 6.	Lunrøe in Norway	Another shock			

	2.	3.	4.	5.	6.
by 7. Bucharest in Wallachia.		A vertical shock			Ann. de Chim. et de Phys. t. xxxiii. p. 406.
— 9. Ditto		Another shock			Ditto.
— 19. Aleppo		Very violent shocks. The motion had continued more or less since January.			Journ. des Débats, 16 Juillet; Moniteur, 17 Juillet.
— 26. Ditto		More shocks			Ditto.
— 28. Castel-Buono in Sicily		Another severe shock.			Ferrari, <i>loc. cit.</i>
— 30. Some places on the Canadian shore of Lake Erie.		An earthquake said to have been felt after the sudden agitation of the lake on this day.	The waters of Lake Erie rose suddenly to the height of 9 feet on the Canadian shore, carrying men and boats inland with irresistible force. The water then fell, and rose again twice to the height of 7 feet. In twenty minutes it resumed its original level, and all was still again. The phenomenon was most remarkable at the mouths of the rivers Otter and Kettle. The water of the former was driven back a mile and a half.		Férussac, Bull. des Sc. Géol. t. xiii. Mai 1828, p. 130; Hertha, B. iii. 1825; Zeitung, S. 81; Trans. Lit. and Phil. Soc. New York, vol. ii. p. 1. § 25.
— 31. Borgo - San - Sepolcro, near the Tiber.		A slight shock			Ann. de Chim. et de Phys. t. xxxiii. p. 406.
— On board the ship 'Neuchus,' on her voyage from S. America to Calcutta. Her place		A severe vibratory shock, lasting nearly four minutes.			Monthly Magazine, vol. lviii. p. 530.



2.	3.	4.	5.	6.
side. Scarcely felt in the neighbouring islands.	Two shocks, of moderate intensity, apparently in a westerly direction.			Ferrara, <i>loc. cit.</i>
— 10. Palermo. More slightly felt at different places in the Va. Jimazzaro.	A severe shock	The sea retired nearly a mile from the coast.	Preceded by great heat, which occasioned contagious diseases. A meteor appeared immediately before the shock. In Bosnia much damage was done. Garnier records these facts in October.	Tilloch's Magazine, vol. lxii. p. 315; Ann. de Chim. et de Phys. t. xxxiii. p. 407.
— 20. Ragusa and in Turkish Bosnia.	A slight shock		Ditto.	Ditto.
— 22. Pawlowsk in the government of Woronesch, Russia.	A strong shock		A mass of rock was moved from its place and rolled away. The detonations heard in this island in 1822 began again in this year, and were heard at different times from March to November (May and June excepted), and afterwards in the month of February 1825. They were occasionally accompanied by slight motion of the ground, but the present is the only distinct shock mentioned.	Paul Partech, Bericht über das Detonationen, Phänomen auf der Insel Meleda, u. s. w. Wien, 1826.
— 23. Island of Meleda in the Adriatic.	Slight shocks			Tilloch's Magazine, vol. lxii. p. 315; Ann. de Chim. et de Phys. t. xxxiii. p. 407.
— 24. Ditto	Ditto		In Tilloch's Magazine the third day given for these shocks is the 27th.	Constitutionnel, 5 Sept.
— 25. Aix in Savoy	Two shocks, of which the second was more violent than the first.			Moniteur, 28 Oct.
— 26. Scala-Nova in Anatolia.	Rather violent shocks.		Accompanied by a rolling noise like that of a cannon.	M. Perrey's Mémoire on Earthquakes in Spain and Portugal, p. 29.
— 27. Valencia in Spain	A very severe shock			
— 28. Near Duenos 9 miles S. of the notice listed first				

1823. Sept. 12. About mid- night.	At the convent of St. Bernard.	A rather severe shock	.....	.....	been tossed about as if by a whirlwind. As v. Hoff remarks, it is very doubtful whether this belongs to the class of earthquake phenomena.	Ann. de Chim. et de Phys. t. xxiv. p. 429; Archiv. des Découv. 1824, p. 211.
— Oct. 1 A.M.	3. Island of Martinique	Two strong shocks	.....	.....	Accompanied by loud noise	Ann. de Chim. et de Phys. t. xxv. p. 432. Keilhau.
— — —	8. Lurrie in Norway	Two shocks	.....	.....	.....	Ditto.
— — —	9. Ditto	Three more shocks	.....	.....	.....	Ditto.
— — —	11. Ditto	One more shock	.....	.....	.....	Ditto.
— — —	23. Minschrift in Siberia	Slight shocks	.....	.....	Accompanied by extraordinary heat	Ann. de Chim. et de Phys. t. xxxiii. p. 407.
— — —	Florizano (or Fiorenzuola in the duchy of Parma?).	A slight shock	.....	.....	.....	Ditto.
— Nov. 11. 5 <sup>h</sup> 45 <sup>m</sup> A.M.	Martinique and other West Indian islands.	Two severe shocks, of remarkably long duration.	.....	.....	No remarkable damage done.	Ditto, t. xxiii. p. 378; Férussac, Bull. des Sc. Nat. 1824, t. ii. p. 236. Keilhau.
— — —	16. Christiania in Norway.	.....	.....	.....	.....	Ditto.
— — —	17. Ditto	.....	.....	.....	.....	Ditto.
— — —	19. Santiago in Chili.	A shock	.....	.....	.....	Ann. de Chim. et de Phys. t. xlii. p. 407; Annual Register.
10 <sup>h</sup> 45 <sup>m</sup> P.M.	Freiburg in the Brisgau.	A vibratory shock	.....	.....	At Breisach a loud noise was heard. At some other places there was only a low noise like a heavy gust of wind. The sound was heard at one or two places where the shock was not perceptible. The Ann. de Chim. et de Phys. make the hour 9 <sup>h</sup> 30 <sup>m</sup> .	Algemeine Zeitung, 1823, Nr. 334; Arch. des Découv. 1824, p. 211; Ann. de Chim. et de Phys. t. xxiv. p. 429.
— 5 <sup>h</sup> 30 <sup>m</sup> P.M.	Also felt at Breisach, Strasburg, Kenzingen, and Schlettstadt.	from W. to E., lasting several seconds.	.....	.....	.....	.....
— — —	23. Arezzo and Sabbiano in Italy.	A slight shock	.....	.....	Accompanied at Sabbiano by a noise like that of a gust of wind.	Ann. de Chim. et de Phys. t. xxxiii. p. 406.
10 <sup>h</sup> 30 <sup>m</sup> P.M.	At Stockholm and some places in Dalecarlia, Sweden. On the same day a shock was felt at Christiania, Friedrichstahl, Mora, and Westerhæa.	A slight shock, felt some minutes earlier in places situated to the west.	.....	.....	Accompanied by a dull sound which seemed to come down from the atmosphere. Shortly after, there was a violent tempest. The shock was not at all felt at the bottom of the mines, but those who were on the ladders of the same were so shaken that they feared the ladders were about to fall.	Berzelius' Jahresbericht, Nr. 4. S. 268; Journ. des Débats, 25 Déc.; Moniteur, 26 et 27 Déc. et 4 Janv.; Keilhau.
6 <sup>h</sup> 5 <sup>m</sup> P.M.						

	2.	3.	4.	5.	6.
iv. 26. (A.M. ?) — 30. P.M.	Calcutta .....	A shock .....	.....	Accompanied by subterranean noise.....	Garnier, <i>Météorologie</i> , p. 139.
c. Be- g of auth.	Island of Martinique ...	A strong undulation..	The sea rose after the shock, and occasioned some damage in the harbours.	Preceded by a very intense noise. The heat had been suffocating during the day. Abundant rain followed the earthquake and lasted ten days.	Ann. de Chim. et de Phys. t. xxx. p. 411.
— 4.	In the government of Taurida, Russia.	Rather severe shocks.	.....	.....	Ditto, t. xxxiii. p. 407.
— 7. Bâle.	Rome .....	A little shock .....	.....	.....	Ditto; Journ. des Débatte, 23 Déc.; Moniteur, 24 Déc.
— 13. Island of Martinique ...	.....	A vibratory shock .....	.....	.....	Merian, p. 5.
— 3 A.M.	Belley in the departm. Ain, France.	Two shocks, slighter than those of November 11. Rather severe shocks, which lasted some seconds, and appeared to be from E. to W. Some persons at Belley asserted that they felt a former shock at 1 A.M.	.....	Preceded by an explosion like that of large pieces of ordnance. An inhabitant of Bionces, who was on the top of a hill at the time of the shock, reported that the heavens appeared to him all on fire an instant after the explosion, although he saw no meteor.	Ann. de Chim. et de Phys. t. xxxiii. p. 407.
—	Mühlheim in the Russian province of Cleve-Berg.	One shock .....	.....	.....	Constitutionnel, 21 Déc.; Ann. de Chim. et de Phys. t. xxiv. p. 429.
an. 2. Macao in China .....	.....	Vibratory shock, lasting five seconds.	.....	.....	Heidelberg Jahrbücher, 1825, Mai, S. 470.
— 5. Trinidad in the island of Cuba.	.....	A rather severe shock.	.....	.....	Asiatic Journal, 1824, Nov. p. 488.
— 6. Bergen in Norway .....	.....	Severe shocks from S.W. to N.E.	.....	Accompanied by subterranean noise which lasted more than a minute.	Ann. de Chim. et de Phys. t. xxvii. p. 377; Archiv. des Découv. 1824, p. 212.
A.M.	.....	.....	.....	.....	Ditto; Moniteur, 20 Fév.

1924. Jan. 7.	Hartenberg in the circle of Elbogen, Bohemia.	Another shock		The plaster was detached from the ceiling of aDitto. chamber in the castle.
— 9.	In the lower parts of the district of Weinsiedel in the Fichtelgebirge, near the Bohemian frontiers.	Ditto		In some places accompanied by subterraneanDitto. rolling noise.
9 <sup>h</sup> 15 <sup>m</sup> P.M.	Hartenberg, Gossengrün, Silbergrün, Bleistadt, Annadorf, Schossen- rent, Pirklies, Markles- grün, Buterbach, Hein- richsgrün, and very violently in the mines of Primlaes.	Ditto		Ditto.
11 P.M.	Ditto	Ditto		Ditto.
2 <sup>h</sup> 45 <sup>m</sup> A.M.	Ditto	Ditto		Ditto.
3 A.M.	Ditto	Ditto		Ditto.
5 A.M.	Ditto	Ditto		Ditto.
7 <sup>h</sup> 30 <sup>m</sup> P.M.	Hartenberg	Ditto	At 4 P.M. the ice on the Zwoda near Har- tenberg broke up, although the tempe- rature was only -7° Reaum.	Ditto.
9 P.M.	Ditto	Ditto		Ditto.
11 P.M.	Ditto	Ditto		Ditto.
11 <sup>h</sup> 15 <sup>m</sup> P.M.	Several other places in the Fichtelgebirge.	Ditto		Ditto.
— 11.	Ditto	Ditto		Ditto.
10 <sup>h</sup> 45 <sup>m</sup> A.M.	Ditto	Ditto		Ditto.
—	Bartenberg	Ditto		Ditto.
—	Ditto	Ditto, rather more severe.		Ditto.
— night Jan. 11 & 12.				Ditto.



	2.	3.	4.	5.	6.
an. 13.	Several places in the Fichtelgebirge.	Another shock.			Authorities quoted above (on the 6th).
—	Ditto, and very strongly in the Bohemian Erzgebirge, especially in Fribus and Bleistadt, and <i>most</i> violently in Prinkles, Pernau, and Leopoldhammer.	Ditto		Wells in the Erzgebirge which had been dry for years became suddenly full of water. This was remarked too at Adorf.	
— 14.	Hartenberg in same region.	Slight tremblings, which recurred on several following days.		Accompanied by subterranean noise.	Ditto.
— 15.	Boves in the province of Comi, Piedmont.	Three shocks, at the hours mentioned.		A meteoric stone fell on this day at Arenazzo near Ferrara (Chladin).	Mém. de l'Acad. de Turin, t. xxix. p. 1.
— 16.	In the district of Munchberg in the Fichtelgebirge.	Another shock			Allgemeine Zeitung, &c., as above.
— 17.	In Chili (at Santiago?).	A severe shock			Ann. de Chim. et de Phys. t. xlii. p. 407.
— 18.	Hartenberg again	Two violent shocks.		Preceded by subterranean noise like thunder	Allgemeine Zeitung, &c., as above.
— 19.	Ditto	Another shock		Accompanied by a strong west wind, a fall of snow, and a slight sinking of the mercury in the barometer.	Ditto.
— 20.	Ditto	Ditto		Ditto	Ditto.
— 21.	Ditto	Ditto		Ditto	Ditto.
— 22.	Ditto	A severe shock		Ditto	Ditto.
— 23.	Ditto	Ditto		Ditto	Ditto.
— 24.	Ditto	Ditto		Ditto	Ditto.
— 25.	Ditto	Ditto		Ditto	Ditto.

1824. Jan. 19.	Hartenberg again	A severe shock			Ditto.
11 <sup>h</sup> 35 <sup>m</sup> A.M.	Gralitz in same region.	Ditto			Ditto.
3 P.M.	Ditto, and at Eger, and Heinrichgrün.	Ditto. Very severe at Heinrichgrün.			Ditto.
4 P.M.	Hartenberg again. (These shocks were felt, though slightly, at Falkenau and Ellenbogen; and more strongly at Stobzenhayn, Hobsbach, the Bohemian Wiesenthal, &c.)	The two most severe shocks felt at this place. The motion seemed to go from Gralitz to Eger, and thence to Hartenberg.		On the 23rd of January a rapid fall of the barometer took place in Germany, France, all Italy, &c. In the after part of the day the mercury stood unusually low, and on the 24th it rose as rapidly as it had fallen. Kastner's Archiv, B. i. S. 125. B. ii. S. 394.	Ditto.
4 <sup>h</sup> 30 <sup>m</sup> P.M.					
—	28. Lunrøe in Norway	One shock			Keilhan.
—	29. Ditto	Ditto			Ditto.
—	30. Ditto	Ditto			Ditto.
—	Manilla in the island of Luçon, Philippine Isles.	Terrible shocks		After the shocks numbers of dead fish were seen floating on the surface of the river.	Garnier, <i>Météorologie</i> , p. 140.
— Feb. 2.	Again in the region of the Erzgebirge and Fichtelgebirge, especially at Heinrichgrün.	The shocks began again.			Preuss, <i>Staatszeitung</i> , &c., as above.
9 A.M.					
—	Ditto	Another shock		The subterranean noise lasted an hour	Ditto.
11 P.M.					
3.	Ditto	Ditto, slight			Ditto.
2 A.M.					
—	Ditto	Ditto, alight			Ditto.
6 A.M.					
—	Ditto	Ditto, severe			Ditto.
10 <sup>h</sup> 45 <sup>m</sup> A.M.					
4.	Ditto	Two strong shocks			Ditto.
7 A.M.					
—	Bobbio in Italy (Kingdom of Sardinia). Also felt at Ivree and Voghesse.	At Bobbio two severe shocks. Three were felt at Ivree, and but one at Voghesse. The latter was strong and lasted four minutes.		Accompanied at Bobbio by noise like that of a storm.	Moniteur, 18 et 20 Fév.; Ann. de Chim. et de Phys. t. xxxiii. p. 406.
At Bobbio, 11 <sup>h</sup> 50 <sup>m</sup> P.M.					
At Voghesse, 10 <sup>h</sup> (11 <sup>h</sup> 56 <sup>m</sup> ).					

	2.	3.	4.	5.	6.
Feb. 5. A.M.	Again in the Fichtelgebirge and Erzgebirge. Hartenberg was apparently the centre of all these shocks.	The general direction of all these shocks seemed to common observation to be N.E. to S.W. The shocks were more severe in the northern part of the district shaken.		The places at which these shocks of Jan. 6-19 and Feb. 2-5 were felt lie nearly together in a line from N.E. to S.W., on the southern slope of the Erzgebirge. On the south bank of the Eger no motion was observed. At Adorf and Munchberg, however, which lie out of the line mentioned, some motion was felt.	Preuss. Staatszeitung, &c., as above.
— 7.	Lunrøe in Norway .....	Another shock .....			Keilhan.
— 11.	Irkutsk in Siberia .....	A slight shock .....			Poggendorff's Annalen, B. ii. S. 155; Ann. de Chim. et de Phys. t. xxvii. p. 377.
— 12.	Eglisau in the Canton of Zurich.	A violent shock .....			Ann. de Chim. et de Phys. t. xxxiii. p. 407.
— 18. P.M. e after th. of	Sala in the province of Palermo (Parma?).	A strong vertical shock .....			Ditto.
— 21. P.M.	Ditto .....	A very strong shock, at first vertical, afterwards horizontal, lasting six seconds.			Ditto.
— 21.	Island of St. Maura (Lionian Isles).	A violent shock .....		Many houses were injured .....	Ditto, t. xxvii. p. 377; Arch. des Déouv. 1824, p. 212.
Mar. 3. A.M.	Chessy in the departm. Rhone, France.	A strong shock said to have been felt.		Bells rang. On the 2nd and 3rd the barometer was very low in Germany, France, and Italy. There was a storm in the Mediterranean, especially on the coasts of Italy, and a heavy fall of snow at Rome, Naples, &c. Kastner's Archiv, B. i. S. 382, B. ii. S. 401.	Perrey's Memoir on Earthquakes in the basin of the Rhone. Notes Additionnelles, p. 15.
— 4.	Pieve-Santo-Stefano in Tuscany.	A strong undulatory shock from W. to E.			Ann. de Chim. et de Phys. t. xxxiii. p. 406.
— 8.	Irkutsk in Siberia .....	Three severe shocks...			Ditto; Journ. des Débats, 7 et 8 Juin.

1824. Mar. 12. foot of the Kholzun range in the S.W. of the Altai Mountains.	Another shock			Keilbau. Ann. de Chim. et de Phys. t. xxxiii. p. 407.
— 16. Borgo-San-Sepolcro in Italy.	A strong horizontal shock.			Keilbau. Férussac, Bull. des Sc. Nat. t. xi. p. 420.
— 27. Lunrøe in Norway	Another shock			
— April 1. In the mine of Zmeinogorsk and at Zyrjanof in the Altai Mountains.	One shock			
— 10. Kingston and other places in Jamaica. At Spanishtown and Old Harbour the shocks were very strong.	Very severe shocks. The motion lasted about 30 seconds, and was the most violent felt for many years. Followed by other slighter shocks from the 10th to the 15th. At Yallahs there were shocks during the night of the 13th and between 1 and 2 A.M. on the 14th. At Port Royal on the 12th about 9 <sup>h</sup> 48 <sup>m</sup> P.M., and on the 13th at about the same hour.		Preceded by a violent wind, and accompanied by loud subterranean noise. Three or four houses fell.	Ann. de Chim. et de Phys. t. xxvii. p. 377; Verneur, Journal des Voyages, t. xxiii. p. 101.
— 20. Island of St. Thomas, West Indies.	A terrible earthquake.			
— About 3 A.M.			Accompanied by a noise like thunder. Many people were thrown out of their beds. A building was swallowed up in consequence of this commotion.	Ann. de Chim. et de Phys. t. xxvii. p. 377.
— May 4. Lunrøe in Norway	Another shock			Keilbau. Ann. de Chim. et de Phys. t. xxvii. p. 377.
— 31. Burg in Prussia	A slight shock.			v. Hoff.
— June 2. Schiraz in Persia.	Some slight motion premonitory of the great earthquake of the 25th.			

1.	2.	3.	4.	5.	6.
June 6. Port-au-Prince in Domingo.	St. One shock				Moniteur, 25 Janv. 1826.
— 10. Sienna in Italy	A strong shock				Ann. de Chim. et de Phys. t. xxxiii. p. 406.
— 19. St. Helena				A large mass of rock fell from the side of Loddies Hill. Perhaps not an earthquake shock.	Constitutionnel, 27 Août.
— 23. In Persia, particularly at Schiraz.	A violent shock, followed by many slighter ones for six days and nights. The principal damage was done by the first and three others which followed it before 10 A.M.			A part of the city of Schiraz was almost completely destroyed and swallowed up. Next to this city Kazroun suffered most. In the neighbourhood of the latter place some mountains were levelled. The day of the most violent shocks was, according to the Persian calendar, the 27th of the month Chaval, in the year 1239. The month of April has been erroneously given as the date of this event. (On the same day there was a renewal of the eruption of Gunung Api in the island of Banda, which began on June 9.)	Vernier, Journal des Voyages, t. xxv. p. 118 (from the Bombay Courier); Revue Encycl. 1825, Mars, p. 846; Hertha, B. i. 1825, &c.
July 9. New Brunswick, North America.	A severe shock			Accompanied by an explosion like that of a piece of ordnance.	Ann. de Chim. et de Phys. t. xxvii. p. 377; Arch. des Découv. 1824, p. 213.
— 15. Monte-Rotundo in the States of the Church.	Ditto			On the 19th (or 29th?) of July there was an extraordinary commotion in the lake of Massaciucoli, territory of Lucca, attended with a sulphurous smell. Numbers of small fish died.	Ann. de Chim. et de Phys. t. xxxiii. p. 407, t. xxvii. p. 386; Kastner's Archiv, B. iv. S. 383.
— 18. In the departm. Eastern Pyrenees, Aude, Tarn, &c.	At Roussillon the shock appeared to be from N.E. to S.W., and lasted four or five seconds.			At Collioure a subterranean noise preceded the shock, and continued four or five seconds after it. At Mont-Louis the atmosphere had been clear and calm all day, but immediately after the shock a violent storm arose. At Perpignan the thermometer rose in the evening to 35° C., and the air seemed to be filled with burning vapours. At Carcassonne there was a blast of wind so impetuous that the inhabitants compared it to the explosion of a gun. All points of the horizon had been illuminated during the day by lightning unaccompanied by those	Le Constitutionnel, 28 Juillet; Ann. de Chim. et de Phys. t. xxvii. pp. 210 et 377; Arch. des Découv. 1824, p. 213.

1824. July 19. Lisbon ..... 5 A.M.	A slight shock.....	The thermometer rose on this day to 40° 5 C. in the shade.	Moniteur, 11 Août; Constitutionnel, 10 Août; Ann. de Chim. et de Phys. t. xxvii. p. 377.
— 29. — to 31.	Lanzerote, Canary Isles Terrible shocks, which became constantly more violent during the time mentioned.	Accompanied by subterranean noise. On the 31st the earth opened and a volcanic eruption began, which lasted until next day. Three other craters afterwards opened, and large masses of lava, vapour, and salt water were ejected. The account is not clearly given, and the 29th of August is wrongly recorded as the date of the commencement, by the Moniteur. The eruption continued until October or even November.	Moniteur, 24 Janv. 1825; Férussac, Bull. des Sc. Nat. t. v. p. 45; t. x. p. 45; Ann. de Chim. et de Phys. t. xxvii. p. 382; Constitutionnel, 23 Oct.; v. Buch, Beschreibung der Canarischen Inseln.
— Aug. 1. — and 2.	Granada in Spain ..... Eight shocks during these two days.		Ann. de Chim. et de Phys. t. xxvii. p. 377.
— In the morn- ing.	8. Comrie in Perthshire ... A strong shock .....	Accompanied by noise as of a heavy carriage rolling upon pavement.	Ditto.
— 10. — 13. — Early in the morning.	Perth ..... Twenty shocks, of which but three were sufficiently strong to cause the church bells to sound. During the following day and night the shocks recurred, but without producing any notable effect.	Accompanied by very loud noise ..... Before these shocks a mist of a peculiar character had been observed in the atmosphere, especially round the sun. A traveller had remarked a fire-ball the night before.	Ditto, t. xxviii. p. 408. Ditto, t. xxvii. p. 377; Preuss, Staatszeitung, 1824, Nr. 217. S. 954.
— 18. —	Harderwyk in Holland... A shock directed towards the S.W.		Ann. de Chim. et de Phys. t. xxvii. p. 377; Constitutionnel, 7 Sept.; Revue Encycl. Oct. p. 244. Keilhau.
— 24. — 29. — 2 and 9 A.M.	Lunrøe in Norway ..... In Chili. (At Santiago?) Severe shocks .....	Accompanied by loud noise like that of a carriage rolling rapidly over an uneven pavement.	Ann. de Chim. et de Phys. t. xlii. p. 407.
— Sept. 2. — 5 A.M.	In the mine Klintch- kinak, 167 wersts from Nertschinsk in Siberia.	Preceded by an extraordinary noise, passing from N. to S., which lasted four minutes. All the buildings rocked. This is said to have been the first shock felt since January 1800.	Férussac, Bull. des Sc. Nat. t. viii. Mai, 1826, p. 21, quoting Sibirsky Vestnik, 1824, Nrs. 15 and 16, p. 97. Keilhau.
— 5. —	Lunrøe in Norway ..... Another shock .....		Keilhau.

	2.	3.	4.	5.	6.
Sept. between 18.	Island of Guadeloupe ...	Several shocks.....	.....	A terrible storm during the night, with thunder and lightning, and on the following morning, heavy rain. Between 1 and 2 a.m., when the storm was at its height, the barometer fell 7 lines below its ordinary height; there an unheard of occurrence.	Journal de Frankfort, 1824, Nr. 325; Ann. de Chim. et de Phys. t. xxxiii. p. 408; Constitutionnel, 3 Sept.
— 9. Basseterre in the same island.	Some more shocks ...	On the 13th a remarkable and irregular rise and fall of tide at Plymouth.	.....	People were awakened by the shocks, but no damage was done.	Constitutionnel, 16 Nov.; Archiv. des Découv. 1824, p. 215.
Oct. 3. Martinique in the West Indies.	Two shocks.....	.....	.....	Some churches, one of the bridges, and many private houses fell. The barracks were completely ruined, so that a camp had to be formed, which was itself destroyed by a tempest on the 1st of November. About four miles from the city the ground opened, and dead fish were observed immediately after floating on a river near.	Ann. of Phil. 1824, Sept. p. 204; Ann. de Chim. et de Phys. t. xxxiii. p. 408. Singapore Chronicle, 25th November 1824.
— 26. Manila in the island of Luzon, Philippine Isles.	Slight shocks had been felt here in the former part of the month, but that of this day was the most violent which had been felt since 1795 (or 6?).	.....	.....	Defonations were heard in this island on the 14th, 25th, 28th, and 29th of October, and 1st, 2nd, 11th, 12th, and 15th of November, unaccompanied by any shock.	Paul Partsch, Bericht, u.s.w.
— Island of Meleda in the Adriatic.	A shock which made the windows rattle.	.....	.....	On the 1st of November a violent tempest blew over the Crimea.	Journal de Frankfort, 1825, Nr. 9.
— 25. Dubossar in the Crimea.	Rather severe shocks	.....	.....	.....	Ann. de Chim. et de Phys. t. xxvii. p. 377, t. xxxiii. p. 408; Constitutionnel, 20 Nov.
— 29. Chambéry in Savoy, and some of the neighbourhood.	A slight shock.	.....	.....	.....	Ditto; Allgemeine Zeitung, 1824, Bell 241.
— Mülheim, Stornberg, and Schramberg, in the Brisgau.	Shocks from S. to N.	.....	.....	At Brunswick some persons supposed they felt a shock during a storm on this night.	Ann. de Chim. et de Phys. t. xxviii. p. 408.
— 30. In the West Indies. (At Martinique?)	More shocks	.....	.....	.....	Allgemeine Zeitung, 1824, Bell 225, S. 903.
Nov. at Mayence.	A vibratory shock	.....	.....	A fire-ball was also observed	.....

3 <sup>30</sup> P.M.	Island of Martinique, West Indies.	A severe shock	At St. Pierre a very high tide threw many ships upon the strand.	part of this year, vid. v. Hoff, Th. v. S. 216. Accompanied by subterranean noise, which appeared at first, however, to proceed from the atmosphere. The earthquake was preceded by great heat, which ceased after the shock, and heavy rain began, which lasted for ten days. Caused no damage. At the first named place extremely hot weather followed the shock, at the second heavy rain.	Revue Encycl. 1825, Fév. p. 542; Férussac, Bull. des Sc. Math. t. iii. p. 303, t. vi. p. 17; Ann. de Chim. et de Phys. t. xxxiii. p. 408.
During the last few days.	Catanzaro and Cosenza in Calabria.	Several shocks		Windows rattled, and objects which were freely suspended swung about. In the morning the sky was full of electrical clouds. After the shock a S.W. wind arose. No similar phenomenon had been felt in this part of the country since 1812, the date of the great earthquake of Caracas.	Journal de Frankfurt, 1824, Nr. 359.
Dec. 6. 2 <sup>45</sup> P.M.	Portsmouth, Havant, Bognor, Aldwick, Ensworth, and Chichester on the south coast of England.	A trembling of three to five seconds duration, during which the ground seemed to heave a little.			Philos. Magazine, 1825, Jan. p. 70; Férussac, Bull. des Sc. Nat. t. vi. p. 186; Journ. des Débat, 12 Déc.
8. Lunrøe in Norway	Lunrøe in Norway	Three shocks			Keilhau.
Palermo	Palermo	A shock			Poggendorff's Annalen, B. xxiv. S. 54.
10. Corigliano and Longobucco, not far from Rosarno, in Calabria Citeriore.	Corigliano and Longobucco, not far from Rosarno, in Calabria Citeriore.	Several shocks.		Houses were thrown down. Three persons perished.	Journ. de Frankfurt, 1824, Nr. 364; Preuss. Staatszeitung, 1825, Nr. 3. S. 20; Constitutionnel, 30 Déc.
17. Fourteen or fifteen leagues to the north of Mariquita in the republic of Venezuela, South America.	Fourteen or fifteen leagues to the north of Mariquita in the republic of Venezuela, South America.	Very severe shock		Not felt at Mariquita	Ann. de Chim. et de Phys. t. xlii. p. 411; Férussac, Bull. des Sc. Nat. Janv. 1831, p. 16.
11 P.M.	Ditto, at Mariquita itself.	The most violent earthquake felt here during this year.		Bells were made to sound. M. Roulin says that two or three years pass without any earthquake being felt in the territory of Venezuela, that then, after a dry and hot summer, the shocks recommence, increase in intensity and frequency until ten or twelve occur in the same day, and on the fall of the first winter rains, suddenly cease. Great irregularity prevails in the propagation of these shocks, and often no correspondence can be traced in them at places very near each other. The barometer is not influenced by them.	



	2.	3.	4.	5.	6.
ec. 23. Jan 5 A.M.	Hamburg. Also at Alfter, a village two miles and a half from Bonn on the Rhine.	Shocks supposed to have been felt. At Alfter there were two.		During a violent storm at Hamburg. At Alfter the beds are said to have swung from side to side.	Journal de Frankfort, 1825, Nr. 2; Gotha'sche Zeitung, 1825, Nr. 4; Journ. des Débats, 6 Janv. 1825.
— 30.	Schiraz in Persia.	Several shocks.			
Jan. 5.	Preuschdorf in the Canton of Worth, arrondissement of Weisenburg, Alsace. Also felt at Lampertsloch.	A slight tremulous shock, lasting 40 or 45 seconds.	On the 3rd the sea rose and fell in an unusual way at Copenhagen.		Journal de Frankfort, 1825, Nr. 50. Constitutionnel, 20 Janv.; Ann. de Chim. et de Phys. t. xxx. p. 412.
—	Cosenza, Rossano, and Corigliano, in Calabria Ultra.	A slight shock, most strongly felt at the last two places.			Journal de Frankfort, 1825, Nr. 41.
— 13. A.M.	Saint-Pierre in the island of Martinique.	Two shocks.		The temperature had been very high up to the moment of the shocks.	Cuvier, Hist. des Sc. Nat. t. ii. p. 247.
— 17. A.M.	Florence.	A slight shock.			Ann. de Chim. et de Phys. t. xxx. p. 412, t. xxxiii. p. 408; Constitutionnel, 9 Mars; Journ. des Débats, 10 Mars.
— 18.	Teramo in the Abruzzo, Italy.	Two ditto.			Ditto.
—	Lunroe in Norway.	Another shock.			Keilbau.
— 19. noon. evening. 45 <sup>m</sup> .	Island of S <sup>a</sup> Maura, Ionian Isles.	A violent earthquake.		Almost totally destroyed the town of S <sup>a</sup> Maura. Many of the inhabitants perished. At Prevesa also houses were thrown down, and the earth opened. Heavy rain followed the earthquake, and lasted several days.	Ann. de Chim. et de Phys. t. xxx. p. 412, t. xxxiii. p. 408; Ferrussac, Bull. des Sc. Nat. t. v. p. 48, t. xi. p. 199; Constitutionnel, 9 Mars; Journ. des Débats, 10 Mars; Preuss. Staatszeitung, 1825, Nrs. 63 u. 82.
— 20. A.M.	Ditto.	More shocks.		Two small houses were thrown down.	Ditto.
—	Iceland, in the southern quarter of the island.	Severe shocks. Several others were felt in the northern part of the island during the month.		Some time before, violent storms and disastrous inundations had been experienced.	Journal de Frankfort, 1825, Nr. 126; Ann. de Chim. et de Phys. t. xxx. p. 412.

1 P.M.	EVENING.				
— 28. Midnight.	In the mines of Zyrjanof, district of Koliwano, Woostresensk, between the Irtsch and Buktarma, at the foot of the Khobzoun range, Altai Mountains.	A shock from E. to W.; strongly felt on the surface of the ground.		Accompanied by loud subterranean noise.....	B.ii.S. 283; Constitutionnel, 30 Janv. Féussac, Bull. des Sc. Nat. t. viii. p. 329, t. xi. p. 420, quoting Asiatsky Vestnik, 1825, Mars, p. 285.
— 30.	Sanza - Protch - Nookopsin on the right shore of Lake Kouban, Russia.	A shock		Accompanied by rather loud rolling noise.....	Ann. de Chim. et de Phys. t. xxxiii. p. 408.
— Feb. 3.	Laurœ in Norway .....	One shock .....	On the 3rd, 4th, and 5th, a violent storm raged in the German Ocean.		Keilhau.
— 4.	Ditto .....	Ditto .....			Ditto.
— 5.	Ditto .....	Ditto .....			Ditto.
— 7.	Ditto .....	Ditto .....			Ditto.
— 18. 8 <sup>h</sup> 15 <sup>m</sup> P.M.	Sienna in Tuscany .....	An undulatory shock, lasting four seconds. Followed, three minutes after, by a second, slighter. A third, still more feeble, occurred at 1 A.M.		During the first shock the bells rang in the upper stories of the houses, and a loud noise was heard, apparently coming from the west. The sky was obscured by clouds, and a very fine rain fell. The barometer was very high, and about 10 P.M. the sky became clear.	Ann. de Chim. et de Phys. t. xxxiii. p. 408; Féussac, Bull. des Sc. Nat. t. v. p. 407, quoting Antologia di Firenze, 1825, Fév. p. 136.
— 21. 0 <sup>h</sup> 30 <sup>m</sup> A.M., 4 A.M., and 7 A.M.	Neighbourhood of St. Vêt near Klagenfurth in Carinthia. Most strongly felt through the Glanthal as far as Wicting and Eberstein. The motion did not extend far.	The first shock was very slight; the second was more severe and lasted several seconds; and the third was again but slight. Direction = S.W. to N.E.		The second shock was severe enough to injure buildings, &c. The third was accompanied by subterranean noise like thunder. Horses, dogs, and birds showed symptoms of fear.	Klagenfurter Zeitung; Preuss. Staatszeitung, 1825, Nr. 57. S. 227.
— 24. 0 <sup>h</sup> 30 <sup>m</sup> P.M.; and about 11 <sup>h</sup> 30 <sup>m</sup> P.M.	Ditto .....	Two more slight shocks.			Journ. des Débats, 14 Mars.

2.	3.	4.	5.	6.
Feb. ... Island of Meleda in the Adriatic.	Four violent shocks during the month, and several slighter disturbances.		On February 8, 12, 13, 15, 16, 18, 19, 22, 26, and 28, the peculiar detonations were heard in this island.	Paul Partsch, Bericht, u.s.w.
— On board the ship 'Recovery,' on her voyage from Madeira to Honduras, near the island of Raatan in Honduras Bay.	A shock which seemed as if the vessel had struck on a bank.		During very gloomy weather. Said to have been felt also at the same time at Balize on the peninsula of Yucatan.	Edinburgh Journal of Science, 1826, Jan. p. 70.
Mar. 2. Algiers and the country about, lying in a line from N.E. to S.W., or from Algiers towards the Canary Isles.	Violent undulatory motion, lasting 55 seconds. During the next four days ten more shocks of less violence were felt.		Some hours before this first shock all the springs at Algiers, and the town of Bidia, eight miles to the S.W., was almost entirely ruined, 7000 (or, according to others, 15,000) persons losing their lives. Near Bidia also two hills are said to have been thrown together, and a village buried between them.	Moniteur et Constitutionnel, 28 Avril; Allgemeine Zeitung, 1825, Nr. 107; Ann. de Chim. et de Phys. t. xxx. p. 413; Monthly Magazine, vol. ix. Nr. 417. p. 463.
— 14. Turin, Rivoli, &c. ....	A slight shock.			Journ. de Savoie, 1825, Avril, p. 254; Ann. de Chim. et de Phys. t. xxxii. p. 408.
— April 6. Saldenhofen in Styria...	Vibratory shock		Accompanied by noise like thunder	Wiener Zeitung, 1825, 25 Avril.
— 10. Sala in Principato Ultra-teriore, kingdom of Naples.	Slight vibratory shock from W. to E.			Kastner's Archiv, B. xiv. S. 318.
— 11. Lagonegro in the Basilicata, kingdom of Naples. Also felt at several other places, especially at Papisidero.	Undulatory, more severe than the last, of four seconds' duration, and ending with a vertical shock.		The Ann. de Chim. et de Phys. gives the date April 14.	Ditto.
— Caracac in S. America.	A violent shock			Ann. de Chim. et de Phys. t. xxx. p. 413; Moniteur, 15 Juin; Journ. des Débats, 14 Juin.
— 17. Lunrøe in Norway	Four trifling shocks.			Kellman.
— Islands of Sumbava, Java, Borneo, and Celebes.	A violent earthquake, lasting eleven days in Sumbava.		The earthquake ended in Sumbava by an eruption of the volcano Tombore, which covered part of the island with pumice. Many of the harbours were ruined, and about 12,000	Foriep's Notizen, B. xx. Nr. 8. (Nr. 426.) S. 114, quoting van Boon, Mosck.

ON THE 24th JUL.					
3. Soon after midnight (of the 2nd ?)	3. Aquila in the Abruzzo Ultrapore.	two or three seconds. A slight shock, followed by a second at 4 P.M.			Ann. de Chim. et de Phys. t. xxxiii. p. 408.
24. 3 <sup>h</sup> 30 <sup>m</sup> and 9 <sup>h</sup> A.M. (P.M. according to the Ann. de Chim. et de Phys.).	24. Catanzaro in Calabria Ultra.	Two shocks, each lasting three seconds.			Ditto; Kastner's Archiv, loc. cit.
28. 3 P.M. the end of the month.	28. Ditto	Another slight shock			Ditto.
June 7. Smyrna At night.	At Mexico				Accompanied by subterranean rolling noise. The Hertha, B. v. 1826; Geogr. Zeitg. shock was considered but a common and little remarkable event by the inhabitants. S. 72.
12. In Chili (at Valparaiso or Santiago ?).	12. In Chili (at Valparaiso or Santiago ?).	A slight shock, lasting three seconds. A severe shock			Ann. de Chim. et de Phys. t. xxxiii. p. 408.
2 A.M. July 2. Algiers and neighbourhood.	July 2. Algiers and neighbourhood.	Very severe shocks, which recurred for several days. A slight shock.			Ditto t. xlii. p. 407.
7. Faenza in Italy	7. Faenza in Italy	An earthquake			Ditto, t. xxx. p. 413; Moniteur et Constitutionnel, 19 Juillet.
21. Pawlowak in the government of Woronesch, Russia.	21. Pawlowak in the government of Woronesch, Russia.	The river Don was in a state of violent agitation, as if disturbed by a storm.			Moniteur, 28 Juillet. Allgemeine Zeitung, 1825, Nr. 252. S. 1008.
25. Rossano in Calabria Cistra.	25. Rossano in Calabria Cistra.	A slight earthquake			Unproductive of any damage. Heavy rain had lately fallen. Preuss. Staatszeitung, 1825, Nr. 218. S. 871.
27. Orsomarso in the same province.	27. Orsomarso in the same province.	Ditto			Ditto.
Aug. 2. Algiers	Aug. 2. Algiers				This account refers, in all probability, to the same event as that given on the 2nd July, the latter being the correct date. Gentleman's Magazine, vol. xcv. pt. 2. p. 172.

2.	3.	4.	5.	6.
Aug. 17. Nieder-Beerbach [A.M.] Hesse Darmstadt.	in Several shocks		Windows rattled, and doors, stoves, &c. were set in motion.	Gothaische Zeitung, 1825, Nr. 136.
— 20. Kingston in the island of St. Vincent, West Indies.	Two severe shocks, with scarcely any interval.			Moniteur, 18 Oct.; Ann. de Chim. et de Phys. t. xxxiii. p. 409.
— 21. Cairo in Egypt [P.M.]	Four rather severe shocks. They seemed to come from due north.		The Egyptians attributed these shocks to the comet which appeared in the following October.	t. xviii. Déc. 1825, p. 428.
— 26. Leghorn [A.M.]	Two distinct undulations.			Moniteur, 8 Sept.; Ann. de Chim. et de Phys. t. xxxiii. p. 408.
— Ditto, and at Genoa [P.M.]	At Leghorn a slight undulation from E. to W. At Genoa the shock was very strong, and lasted 5 or 6 seconds.			Ditto.
pt. 1. Harbour of Peter and Paul, Kamtschatka.	An earthquake, of 9 secs. duration.			Allgemeine Zeitung, 1826, Nr. 205. S. 820.
— 7. Orsomarso in Calabria Citra.	A slight shock.		A spring which rose half a mile from the place ceased to flow. The account probably refers only to the same event as that given on 27th July.	Ann. de Chim. et de Phys. <i>loc. cit.</i>
— 20. Demerara in the north of S. America. Also felt at the same time in the islands of Barbadoes and Trinidad.	The most severe shock felt for many years in Demerara. It was oscillatory, in the direction W. N. W. to E. S. E., and lasted 3 or 4 minutes (secs.). Followed by a lighter shock an hour afterwards.	The sea was agitated by an oscillatory motion analogous to that felt on shore.	Accompanied in Demerara by a dull heavy noise. There was a light wind from the N. W.; the atmosphere was clear about the zenith, but clouded in the northern horizon. The second shock was attended by a sudden gust of wind. In the island of Trinidad several houses were thrown down.	Allgem. Konst. en Letterbode, 1825, 2 Dec.; Ann. de Chim. et de Phys. t. xxx. p. 412.
L. 3. In the West Indies (in which island is not mentioned).	A vibratory shock			Leonhard's Zeitschrift, 1826, B. ii. S. 360.
— 5. Harbour of Peter and Paul, Kamtschatka.	An earthquake, of 3 secs. duration.			Allgemeine Zeitung, 1826, Nr. 205. S. 820.

1825. Oct. 23. About 8 <sup>h</sup> and 30 <sup>m</sup> P.M.	Aquila in the Abruzzo, Kingdom of Naples.	The first shock was very severe, and of rather long duration. The second was slighter.	Oct. 17-20, the barometer was unusually low in N. Germany, and it blew a violent storm.	Kastner's Archiv, B. xiv. S. 323; Ann. de Chim. et de Phys. t. xxxiii. p. 408.
— 24. 3 A.M.	Ditto	Another shock, followed by three more during the ensuing evening and night.	Ditto.	
— Towards the end of the month.	Schiraz in Persia.	A shock almost as severe as that of the year before.	Numbers of buildings were reduced to ruins	Madras Courier, Journal Asiatique, 1826, Jun. 3. p. 800; Monthly Magazine, 1826, July, p. 74.
— Nov. 7. 10 <sup>h</sup> 35 <sup>m</sup> A.M.	Harbour of Peter and Paul in Kamtschatka.	An earthquake of 20 secs. duration.		Allgemeine Zeitung, 1826, Nr. 205. S. 820.
— 19. In the morning.	Port-au-Prince in Haiti.	Violent shocks, lasting four or five seconds. This is said to have been the third earthquake of the year.	Accompanied by a dull noise coming from the S.E.	Ann. de Chim. et de Phys. t. xxx. p. 413; Moniteur, 25 Janv. 1826.
— 30.	In the West Indies. In which of the islands is not mentioned.	Shocks	The subterranean noise accompanying these shocks was more distinct, and louder than on former similar occasions. Preceded for several days by heat of very unusual intensity for this time of year. Immediately after the earthquake the weather became cooler, and heavy rain with thunder set in and lasted for ten days.	Leonhard's Zeitschrift, 1826, B. ii. S. 360.
Dec. 8. Between 10 and 11 P.M.	Geneva	A severe shock		Journ. des Débats et Constitutionnel, 19 Déc.; Ann. de Chim. et de Phys. t. xxx. p. 414.
— 23. 5 A.M.	Strasbourg, Kehl, Sundheim, Neumühl, Kork, Offenbourg, and very slightly at Mannheim.	Shocks, which were strongest at Strasbourg, and were there in the direction N.E. to S.W., or N. to S. At Strasbourg the watchman attached to the cathedral felt his bench shaken	At Strasbourg the weather was calm and the sky overcast. A slight wind blew from the south. The barometer was at 27 in. 11 lines, about 2 lines below the mean height, and the thermometer at +1°-25 R. An extraordinary bellowing sound had been heard in the air between 3 and 4 A.M. Dec. 6-9, violent storms and inundations on the coasts of the Mediterranean and Adriatic.	Constitutionnel, 28 Déc.; Ann. de Chim. et de Phys. t. xxx. p. 414; Allgemeine Zeitung, 1825, Nr. 363. S. 1451 u. Beilage, Nr. 365; Preuss. Staatszeitung, 1826, Nr. 8. S. 33.

	2.	3.	4.	5.	6.
Dec. ...	Admont in the circle of Judenburg in Styria.	about 4 <sup>h</sup> 45 <sup>m</sup> , and then three or four shocks ensued. Slight shocks, which recurred from time to time up to the 15th May, 1826, when a violent earthquake took place.		Accompanied by subterranean noise	Leonhard's Zeitschrift, 1826, B. ii. S. 536.
Jan. 7.	Island of Martinique	An earthquake, consisting of two shocks; the one slight, the other violent.		The inhabitants were alarmed by the stronger shock of the two, but no damage was done.	Ann. de Chim. et de Phys. t. xxiii. p. 412; Revue Encycl. Mars, p. 866.
— 23.	Lunrøe in Norway	A severe shock		The town was much injured	Keilhau. Constitutionnel, 9 Mars; Ann. de Chim. et de Phys. t. xxxiii. p. 409; Allgemeine Zeitung, 1826, Nr. 63. S. 252.
— 26.	Prevesa in Albania	A violent shock			
—	The most southern of the 'Isles de l'Archipel,' islands lying to the south of Fat-sio, Bonin, &c.	A violent earthquake.		Accompanied by a hurricane or typhoon, which raised the sea twelve feet above its ordinary level.	Humboldt, Fragmens de Géologie et de Climatologie Asiatiques, t. i. p. 228; Beechey's Voyage to the Pacific (London, 1831), pt. 2. p. 513.
Feb. 1.	In the Basilicata, kingdom of Naples. Also (two shocks) felt at Naples and Avellino, the hour however not being given. The places shaken lie in a line running nearly due E. and W.	A shock, which was at first vertical, and then became horizontal, and undulatory from N. to S., and lasted more than 20 secs. Two other shocks followed, with an interval of half an hour.		Houses were thrown down in the commune of El Tito (Huot, in his 'Cours de Géologie,' records the earthquake at this place as occurring at the end of February), and Potenza also suffered. The weather had been cold and rainy up to the 29th January, but on the 1st February almost unbearable heat set in. Smoke issued for several days about this time from Vesuvius. V. Hoff gives a separate account, identical with this, on the 1st Feb. 1827, but there was probably but one earthquake, that here recorded.	Journ. des Débats, 21 Fév.; Moniteur, 24 Fév. et 7 Mars; Preuss. Staatszeitung, 1826, Nr. 55. S. 220.
— 8.	Constantinople and (at same hour) Smyrna.	Constantinople three severe shocks from N. to S. Due			Constitutionnel, 31 Mars; Ann. de Chim. et de Phys. t. xxxiii. p. 409; Preuss. Staatszeitung, 1826, Nr.

1826. Feb. 21. 9 P.M.	Tornea in Lapland .....	ring the night some other slight shocks were felt. At Smyrna the shock was but little remarkable.	On the 20th it blew a violent storm from the south for nearly 24 hours. At the time of the earthquake the atmosphere was calm and clear. A sound which, at first dull and low, changed to an alarming rattling noise, accompanied the shock. Buildings shook.	On the 20th it blew a violent storm from the south for nearly 24 hours. At the time of the earthquake the atmosphere was calm and clear. A sound which, at first dull and low, changed to an alarming rattling noise, accompanied the shock. Buildings shook.	Allgemeine Zeitung, 1826, Beil. Nr. 109. S. 433; Leonhard's Zeitschrift, 1826, B. ii. S. 426.
---	Laurde in Norway .....	Another shock, probably at the same time as that at Tornea.			Keilhan.
---	Brieg in the Valais .....	Violent tremulous shocks; the most severe which had been felt at this place since 1817.			
Mar. 18. 0 <sup>h</sup> 20 <sup>m</sup> A.M.	Pearro in the States of the Church.	The sea was a little agitated.			Ann. de Chim. et de Phys. t. xxxiii. p. 408; Archives des Découvertes, 1826, p. 193.
0 <sup>h</sup> 40 <sup>m</sup> P.M.	Ditto .....	A more intense shock.			Ditto.
1 <sup>h</sup> 14 <sup>m</sup> P.M.	Ditto .....	A slight shock			Ditto.
2 <sup>h</sup> P.M.	Ditto .....				Ditto.
				V. Hoff gives the hour 4 <sup>h</sup> 2 <sup>m</sup>	



	2.	3.	4.	5.	6.
Jan. 18. P.M.	Pesaro in the States of the Church.	A slight shock.			Ann. de Chim. et de Phys. t. xxxiii. p. 408; Archives des Découvertes, 1826, p. 193.
— 19. A.M.	Ditto	Rather slight, from S.E. to N.W.			Ditto.
— 20. A.M.	Ditto	Ditto			Ditto.
— 21. A.M.	Ditto	Ditto, rather prolonged.			Ditto.
— 22. A.M.	Lunrøe in Norway	Another shock.			Keilhan.
— 26. P.M.	Kremsmünster in the circle of Traun, Austria. Also felt (at same time) at Vöcklabruck, 4 miles further to the W. by S., and in the neighbourhood.	Some slight shocks. The first seemed to move in a north-westerly direction ( <i>from or to N.W.?</i> ), and was rather horizontal. The other shocks seemed to be more vertical.		Principally felt in the upper stories of the houses. Boxes and furniture were shaken about. No change in the height of barometer or thermometer was observed. There was a light wind from the N.E., and the sky was clouded, but cleared up in the evening.	Preuss. Staatszeitung, 1826, No. 92. S. 367.
Pr. 3.	Admont in the circle of Judenburg in Styria.	A distinct shock		The walls of the chapter-house rocked. The noise was very distinct. Wind westerly, with a clear atmosphere.	Leonhard's Zeitschrift, 1826, B. ii. S. 536.
— 6. A.M. Aff says a.)	Pesaro in the States of the Church.	Another slight shock, said to be from S.W. (S.E.?) to N.W.			Ann. de Chim. et de Phys. t. xxxiii. p. 408; Archiv. des Découv. 1826, p. 193.
— 14.	Palermo	A shock			Poggendorff's Annalen, B. xxiv. S. 54.
— 14.	St. Brieux in the department Côtes du Nord, and the neighbourhood.	A shock from E. to W., lasting 12 or 15 secs.		Preceded by a noise like that of a carriage rolling over stones.	Ann. de Chim. et de Phys. t. xxxiii. p. 410; Ferrussac, Bull. des Sc. Nat. t. viii. p. 329.
— 22. M.	Santiago in Chili	A severe shock			Garnier, Météorologie, p. 148.
— 22.	In Granada, Spain	A violent earthquake.		This account is said by v. Hoff to be doubtful.	Keferstein's Geognostische Zeitung, St. 4. S. 112.
— 25. P.M.	Lunrøe in Norway	Another shock			Keilhan.
— 25.	Jelissabetspol or Ham-aha, 158 wersts from Tiflis in Georgia.	A severe vibratory shock, lasting 20 secs.		Accompanied by subterranean noise. No damage done.	Preuss. Staatszeitung, 1826, Nr. 192. S. 767.

1826 May 2, Island of Martinique ... 0 <sup>h</sup> 35 <sup>m</sup> A.M.	A shock of remarkably long duration, and severe enough to waken all who were asleep.			Revue Encycl. Juillet, p. 236.
— 15. Admont in the circle of Judenburg in Styria. Also on this day at Grätz, thirteen geographical miles to the S.E. of Admont.	The first strong shock was succeeded by oscillations which, at first rather violent, gradually became weaker. The earthquake seemed to come from the east, from the neighbourhood of Glaus, and extended to Rottenmann (two (German?) miles to the S.W.) and Gallenstein. At Grätz the shock was rather severe, and recurred eight times before the end of May. Several shocks. Others followed on this and the next day.	Preceded by a low subterranean noise which constantly increased in distinctness. A loud noise like the explosion of a piece of heavy ordnance at a distance accompanied the first shock. Clocks were thrown down, and persons who were asleep were thrown out of their beds. The air was calm, and the sky overcast with thick clouds, which sank in large masses into the valley. The day before, the heavens had been clear, but in the evening a strong east wind blew at the level of the tops of the trees, though but little felt at the surface of the ground. At Grätz one of the shocks felt during this month was accompanied by a loud noise, and caused the people to leave their houses.	Leonhard's Zeitschrift, 1826, B. 2, S. 536; Gerassche Zeitung, 1826, Nr. 93.	
— 11 A.M.	Granada in Spain	Preceded by loud subterranean noise. The other shocks of the 15th and 16th were unattended with noise. Rain, and cold wind.	Journ. des D <sup>é</sup> ats, 5 Juin; Ann. de Chim. et de Phys. t. xxxiii. p. 410. Arch. des D <sup>é</sup> couv. 1826, p. 193; Allgemeine Zeitung, 1826, Nr. 160. S. 638.	
— 17. Ditto About dawn.		Accompanied by a terrible bellowing noise. Several buildings were more or less injured.	Ditto; Preuss. Staatszeitung, 1826, Nr. 141. S. 563.	

	2.	3.	4.	5.	6.
of 20. June. Granada in Spain ..... the days outl. .... P.M.	Lunrise in Norway ..... Felt at the same time in the Campagna in Principato citeriore, ten geographical miles to the west, and more slightly at Salerno, fourteen miles in the same direction.	Another shock ..... Some more slight shocks.			Keilbau. Journ. des Débats, 7 Août; Moniteur, 2 et 8 Août; Ann. de Chim. et de Phys. t. xxxiii. p. 410; Arch. des Découv. 1826, p. 194. Preuss. Staatszeitung, 1826, Nr. 152. S. 606; Moniteur, 28 Juin.
- 12. A.M.	Smyrna. About this time severe shocks were also felt in the island of Metellino in the Archipelago.	Slight undulatory shock from N. to S., lasting about twelve seconds.		The places shaken on this occasion lay in the same line as those at which the earthquake of February 1 was felt.	Preuss. Staatszeitung, 1826, Nr. 208. S. 832; Leonhard's Zeitschrift, 1826, B. 2. S. 539; Ferussac, Bull. des Sc. Nat. t. xi. p. 30.
- 17. P.M.	Santa Fé-de-Bogota in Columbia, S. America.	An earthquake, lasting thirty seconds.		The second shock greatly injured many churches and other buildings, several of which fell on the following day. In a desert place, on the Cerro-Centro, one mile S.W. from the town, a cleft opened of 200 feet wide, from which there arose sulphurous vapours. The motion was so violent that M. Boussingault compares it to that of a boat on a stormy sea, and says that he with difficulty descended the stairs of his house during the second shock. The slight shock felt at midnight was accompanied by a dull noise coming from the east. This earthquake, the most violent felt here since 1805, was preceded by long-continued drought, and immediately followed by very heavy rain. At the time of the shock the heavens were clouded and the air quite calm.	Moniteur, 1826, Nr. 246 et 254; Allgemeine Zeitung, 1826, Nr. 252, u. 260; Journal Columbus, B. ii. S. 429; Archiv. des Découv. 1826, p. 194; Garnier, Météorologie, p. 149.

1826. May 13. Potenza in the kingdom of Naples.	tion. About midnight another slight movement was perceived. A slight shock like that of the 4th, lasting ten seconds.			Prens, Staatszeitung, 1826, Nr. 166. S. 663.
— 19. Santa Fé-de-Bogotá	Some slight shocks. M. Poussingault observed by means of his declination needle that the earth was still in a state of almost constant motion. Another very distinct shock. The motion was horizontal, from S. to N., and lasted some seconds.			Moniteur, &c., as above.
— 20. Ditto 11 A.M.				Ditto.
— 21. Ditto At night.	Some more oscillations.			Ditto.
— 22. Ditto 8 <sup>h</sup> 45 <sup>m</sup> A.M.	Violent oscillations, horizontal and in the same direction as before, lasting 25 or 30 sec. From the 22nd to the 29th some more slight movements of the earth were perceived. Two slight shocks			Ditto.
— 23. Venice 1 <sup>h</sup> 30 <sup>m</sup> or 2 <sup>h</sup> 30 <sup>m</sup> P.M.				Allgemeine Zeitung, 1826, Nr. 192. S. 767; Journ. des Débats, 10 Juillet; Ferrusac, Bull. des Sc. Nat. t. xii. p. 215, t. xv. p. 247.
— 23. Innsbruck 8 <sup>h</sup> 30 <sup>m</sup> P.M.				Ditto; Prens, Staatszeitung, 1826, Nr. 158, S. 631, Nr. 164, S. 656, Nr. 166, S. 663; Gotha'sche Zeitung, Nr. 111 u. 116; Leonhard's Zeitschrift, 1826, B. ii. S. 478, 1827, B. i. S. 86.

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24. Innsbruck .....		A much stronger shock. The motion undulatory.		A accompanied by loud noise. Articles of furniture were rather violently thrown about.	Authorities quoted above (on the 23rd).
— " —	Trente, Roveredo, Brixen, Mantua, places on the lake of Zürich, as Wädenschwyl, Stöfa, and in the Seefeld near Zürich, and elsewhere in the Tyrol, the Switzerland, and Upper Italy.	At Trente the shock was undulatory, and lasted two seconds, in the direction E. to S. (?) At Roveredo the motion was slight, undulatory, from S.E. to N.W., and lasted fifteen seconds. At Brixen there were three shocks, from S. to N., the third of which was the most violent. At Mantua, a slight earthquake of some seconds' duration.		At Trente accompanied by a gust of wind from the S., after which a gentle and somewhat cooler breeze blew up to 5 P.M. The sky was quite cloudless before the shock, but after it clouds gradually collected. The barometer fell at the moment of the shock 1.3 line, and went up again (in what time?) after it within 5 lines of its former height. At Brixen the weather had been windy for several days before, but during the shocks a perfect calm prevailed, after which the wind rose again, and warm weather followed. v. Hoff remarks that the places at which this earthquake was felt lie in a line running almost exactly N. and S., and concludes that the centre of disturbance lay between Brixen and Trente. The accounts vary considerably as to the hours at which the different shocks occurred. Probably those given for the 23rd at Venice and Innsbruck really occurred on the 24th, and perhaps 1 <sup>h</sup> 30 <sup>m</sup> or 2 <sup>h</sup> 30 <sup>m</sup> on that day is the correct time for all.	Ditto.
— " —	St. Brieux in the department. Côtes du Nord. Granada in Spain .....	One shock .....			Férussac, Bull. des Sc. Nat. t. xv. p. 247.
— " —		Frequent slight shocks .....			Allgemeine Zeitung, 1826, No. 206. S. 822; Preuss. Staatszeitung, 1826, Nr. 187, S. 751; Moniteur, Nr. 220, p. 1156.
— " —		Two shocks .....			Journ. des Débats, 7 Août; Moniteur, 2 et 8 Août; Ann. de Chim. et de Phys. t. xxviii. p. 410.
16. Ditto .....		Three shocks .....			Ditto.

Guadeloupe. 18. Jamaica, in Mondego Bay. 40 <sup>m</sup> A.M.	Two rather severe shocks. any interval.	A violent tempest soon after in the West Indian sea.	Some buildings were injured.	Moniteur, 16 Oct.; Columbus, B. ii. S. 429.
19. Bender near Odesa, Russia. 30 <sup>m</sup> A.M.	A slight vibration, lasting 15 seconds.			Journ. des Débats, 24 Oct.
31. Nicastro in Calabria Ultra. 1 A.M.	Two severe shocks.			Leonhard's Zeitschrift, 1827, B. i. S. 250.
Sept. 1. Monteleone, five geographical miles S. by W. from Nicastro.	A slight trembling.			Ditto.
7. Larvik in Norway.	Another shock.			Keilhau.
16. St. Jean de Boisseau in the department Loire-Inférieure.	Two slight shocks, from S.W. to N.W. (?)			Journ. des Débats, 28 Sept.
18. St. Jago in Cuba. Also felt, though more slightly, at Kingston in Jamaica. between 3 and 4 A.M.	Three shocks, of which the second was the most severe. Each lasted nearly a minute.		Accompanied by loud noise, which at first resembled the rolling of a waggon over stones, and ended with an explosion as of a large number of heavy pieces of artillery. The weather was unbearably hot. Half the town of St. Jago was destroyed.	Allgemeine Zeitung, 1826, Nr. 339; Atlantis, by Rivinus, B. i. 1827, S. 68; Ann. de Chim. et de Phys. t. xxxiii. p. 412; Moniteur et Constitutionnel, 30 Nov.
28. Innsbruck in the Tyrol. 30 <sup>m</sup> A.M.	Violent undulatory shock.		Accompanied by noise like thunder.	Leonhard's Zeitschrift, 1827, B. i. S. 250.
... In the provinces of Oranto, Italy.	Several shocks during the month.			Ann. de Chim. et de Phys. t. xxiii. p. 408.
Oct. 1. Ofen, Pesth, Pils, Monor, and Giömrö, in Hungary.	Violent shocks felt at the same time at these different places.			Leonhard's Zeitschrift, 1827, B. i. S. 261.
13. Santiago in Chili.	A severe shock.			Garnier, Météorologie, p. 151.
In the mountains of middle Praauw (Prah?), in Java.	Severe shocks.		Equal in intensity, though not in destructive effects, to the shock of the 19th of Nov. 1822. On the 11th the mountain Pakowodjo had burst. Similar phenomena took place in the mountains of Klut, but whether any eruption occurred is not mentioned.	Leonhard's Zeitschrift, 1827, B. i. S. 566.
15. Savannah in Georgia, United States.	A violent earthquake.	On the same day it blew a terrible gale of wind from the north, which forced many ships to put into harbour.		Constitutionnel, 2 Déc.

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Catanzaro in Calabria Ultra, and Messina in Sicily.	Several shocks			Journal de Savoie, 1826, 10 Nov. p. 1089.
26. Naples and in the pro- vince of Bari.	A shock, apparently in the direction N.E. to S.W.			Moniteur, 29 Nov.
27. Isernia in the province of Molise, kingdom of Naples. And, about the same time, at Aquila in the Abruzzo Ulteriore.	Several shocks			Ditto; Kastner's Archiv, B. xiv. S. 323.
29. Cosenza in Calabria Citra.	Two severe shocks			Moniteur, 29 Nov.; Keferstein's Geogn. Zeitung, St. 4, S. 103.
v. 5. Lunrøe in Norway	Another slight shock.			Kellhu.
26. Island of Arran, between Scotland and Ireland.	A shock of three or four seconds' dura- tion.		Accompanied by a rattling noise. The sky was clear, and there was but little wind at the time.	Edinburgh Journal of Science, vol. vi. p. 370.
27. Trento in the Tyrol	A vibration		This account v. Hoff considers doubtful	Kastner's Archiv, B. xiv. S. 244.
14. Granada in Spain	A violent shock. A few moments after, four slighter shocks were felt, and at 8 P.M. a very severe one.		Many persons were thrown out of their beds	Gothaische Zeitung, 1827, Nr. 10; Moniteur, 10 Janv. 1827; Ferns- sac, Bull. des Sc. Nat. Avril, 1828, p. 396.
15. At Innsbruck, in the whole valley of Mon- tafion in the Tyrol, at Augsburg. Lindau, Core, Winterthur, Schaffhausen, and Zü- rich. Also at St. Gall and Herisau. The limits of the earth- quake seem to have been Zürich on the west, and Innsbruck on the east.	Shocks, more or less severe at the differ- ent places named. In Innsbruck and the Montafon. That two violent vibra- tions, following ra- pidly one on the other, were ob- served, the direc- tion being N. to S. At Augsburg the motion was con-		At Zürich the shock was not felt in every part of the town. Windows rattled, the pendu- lums of clocks were disturbed, and wainscot cracked.	Moniteur, 3 Janv. 1827; Allgemeine Zeitung, 1827, Nr. 1. S. 3; Go- thaische Zeitung, 1826, Nr. 206, 1827, Nr. 11.

<p>1826. Dec. 16. Innsbruck .....  5<sup>h</sup> 39<sup>m</sup> P.M. ....  25. Ardvoirlich (Lough Erne) in Scotland, and at the same hour at Leadhills. ....  2 P.M. ....</p>	<p>tory from E. to W., lasting some seconds. At Zürich a slight shaking motion had been observed between 7 and 8 P.M., like a gust of wind. The direction of the principal shock was said to be N.E. to S.W. At 3 A.M. on the 16th another was perceived. ....  Another shock, lasting thirty seconds. ....</p>	<p>Accompanied by noise like thunder .....  The sound which preceded the shock was like that of a blast in a quarry. The day was warm, thick, and hazy. On the 30th of this month a small river in East Gothland, Sweden, suddenly stopped at a particular place, so that it could be passed dryshod, but there seems nothing to prove that this was caused by any earthquake shock. ....  Accompanied at Montagne and Alençon by a very loud noise. Chimneys were thrown down, and panes of glass broken. The sky was clouded, and the weather lowering and stormy. ....</p>	<p>Leonhard's Zeitschrift, 1827, B. I. S. 341. ....  Kastner's Archiv, B. xiv. S. 192; D. Milner's Catalogue of British Earthquakes, <i>loc. cit.</i> ....</p>
<p>1827. Jan. 2. Montagne (department de l'Orne), Alençon, and neighbourhood. Also at Easonne and Corbeil in the department Seine-et-Oise. ....  (Jan. 1 according to v. Hoff.) "à l'heure du dîner." At Easonne and Corbeil, at 3<sup>h</sup> 45<sup>m</sup> P.M. ....  14. Near Wagstadt in Silesia. ....</p>	<p>A violent shock, though of short duration. ....  A shock .....  An earthquake .....  Ditto .....  In the Crimea .....  In Calcutta .....  In the middle of the month. ....</p>	<p>After the shock a piece of land of about 3000 square klafters in extent sank seven feet. From the 14th to the 17th a tremendous storm raged over England, Holland, Germany, and Prussia. ....</p>	<p>Journ. des Débats, 12 Janv.; Constitutionnel, 10 Janv.; Ann. de Chim. et de Phys. t. xxxvi. p. 398. ....  Gothaische Zeitung, 1827, Nr. 35. ....  Hamburg Correspond. 1827, Nr. 94. ....  Kastner's Archiv, B. xiv. S. 244. ....</p>



2.	3.	4.	5.	6.
b. 9. In the island of Anglesea, and the north-west part of Wales. Also at Ripon in Yorkshire.	Lasted forty seconds to one minute.		Accompanied in Wales by a noise like that of a cart laden with stones. Furniture was overturned. At Ripon a tremendous explosion was heard, which shook the whole neighbourhood. A fissure was formed, nearly twenty yards wide, and twenty-four yards deep.	Phil. Mag. N. S. vol. iii. p. 463; D. Milne's Catalogue, <i>loc. cit.</i> ; Ann. de Chim. et de Phys. t. xxxvi. p. 399.
- 11. El Zito in the Basilicata, kingdom of Naples.	A violent shock			Kastner's Archiv, B. xiv. S. 324.
- 18. Aquila and Zeranio, kingdom of Naples.	Tremblings		Unproductive of any damage.	Ditto, S. 326.
r. 7. Lunroe in Norway	Another shock			Bull. de la Soc. Géol. t. vii. p. 21.
- In Leghorn. Also felt at Singaglia.	Slight tremblings from time to time for eight successive days. Direction = S.E. to W. (?)			Kastner's Archiv, S. 326.
- 17. Palermo	A shock		On the 17th, 18th, 21st, and 22nd, there were violent and widely extended storms in various parts of Europe.	Poggendorff's Annalen, B. xxiv. S. 54.
- 18. Lunroe in Norway	Another shock			Bull. de la Soc. Géol. t. vii. p. 21.
- 19. Palermo	Another shock			Poggendorff's Annalen, B. xxiv. S. 52.
il 1. Venice	Three slight oscillations.			Allgemeine Zeitung, 1827, Nr. 107. S. 408.
- Appenzell; and at the same time in the Engadine, at St. Gall, Trente, and Venice.	An earthquake consisting of three oscillations.		Probably the last account refers to the same event as that here recorded, or to the following.	Kastner's Archiv, B. xv. S. 140; Ann. de Chim. et de Phys. t. xxxvi. p. 399.
- 2. Bevers in the Upper Engadine.	Two successive shocks. This was the twentieth time that earthquake shocks had been felt at this place during the winter.			Ditto; Hamburg Correspond. 1827, Nr. 74; Phil. Mag. N. S. vol. iii. p. 463.
- 11. The islands of Ponza and Iachio, off the coast of Naples.	Violent vibratory shocks. The direction was from Ponza.			Pioriep's Notizen, Nr. 496 (B. xxiii. No. 12), quoting Cavelli.

1 <sup>st</sup> A.M.	the Church.	lations.			
— 17.	Venice .....	A slight vibratory shock.	.....	.....	p. 408. Hamb. Corresp. 1827, No. 77.
— 18.	Trieste .....	Two shocks, lasting some seconds. Direction = N. to S.	.....	More strongly felt in the houses on the sea-shore than in those more inland.	Gothaische Zeitung, 1827, Nr. 73.
— 25.	Lunrøe in Norway .....	Another shock.	.....	.....	Bull. de la Soc. Géol. t. vii. p. 21.
day 2.	Trente in the Tyrol .....	A severe shock	.....	.....	Férussac, Bull. des Sc. Nat. t. xviii. p. 195.
9 <sup>th</sup> A.M.	Lunrøe in Norway .....	Another shock.	.....	.....	Bull. de la Soc. Géol. t. vii. p. 21.
— 11.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 13.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 17.	Ditto .....	Five shocks.	.....	.....	Ditto.
— 18.	Ditto .....	.....	.....	.....	Ditto.
— 27.	Ditto .....	Another slight shock.	.....	.....	Ditto.
— 28.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 29.	Ditto .....	Ditto .....	.....	.....	Ditto.
—	Pajaca in Mexico .....	Two slight shocks	.....	.....	Phil. Mag. N. S. vol. iii. p. 463; Constitutionnel, 6 Oct.; Ann. de Chim. et de Phys. t. xxxvi. p. 398 et t. xlii. p. 407.
— 30.	Lima in Peru .....	Violent shocks	.....	The walls of the principal buildings were thrown down. Incalculable damage was done in the city.	Ann. de Chim. et Phys. t. xxxix. p. 406, t. xlii. p. 407.
—	Santiago in Chili .....	A rather slight earthquake.	.....	Probably the same with the Peruvian earthquake.	Garnier, Météorologie, p. 152.
June 2.	Lunrøe in Norway .....	Three shocks	.....	.....	Bull. de la Soc. Géol. t. vii. p. 21.
— 3.	In the Island of Martinique.	A slight vibratory shock.	.....	At the same time the first rain fell after <i>sixty-six days</i> drought; no such instance of dry weather in the West Indies was remembered.	Phil. Mag. N. S. vol. iii. p. 463; Hertha, B. x. S. 105, B. xii. S. 182.
—	Lunrøe in Norway .....	Two more shocks	.....	.....	Bull. de la Soc. Géol. t. vii. p. 21.
— 4.	Ditto .....	Another shock.	.....	.....	Ditto.
— 5.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 6.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 12.	Palermo .....	Several shocks, which lasted with short intervals for 18 minutes. The motion was constantly oscillatory.	.....	.....	Ann. de Chim. et de Phys. t. xxxvi. p. 399; Férussac, Bull. des Sc. Nat. t. xviii. p. 196.

2.	3.	4.	5.	6.
e12. Tehuacan in Mexico ... A.M.	A violent shock		Accompanied by terrible noise. Many buildings were injured.	Phil. Mag. N. S. vol. iii. p. 463; Constitutionnel, 6 Oct.
-16. Aquila in the kingdom of Naples.	A slight shock.			Phil. Mag. N. S. vol. iii. p. 463.
-21. Palermo	Four severe shocks in seven seconds. The motion was oscillatory, and from W. to E.		No damage done.	Ditto; Poggendorff's Annalen, B. xxiv. S. 54.
-29. Ditto	Another shock			Poggendorff's Annalen, B. xxiv. S. 54.
-or The town of Tokat in the government of Sivas, Asia Minor.	An earthquake		A large part of the town was destroyed. The damage done extended also to the surrounding country.	The Gothaische Zeitung, 1827, Nr. 134; Kastner's Archiv, B. xiv. S. 216; Constitutionnel, 25 Août.
ly 5. Palermo	Another shock			Poggendorff's Annalen, B. xxiv. S. 54.
- Santiago in Chili	A slight shock			Ann. de Chim. et de Phys. t. xlii. p. 407.
- 7. Lunrøe in Norway	Three shocks			Bull. de la Soc. Géol. t. vii. p. 21.
- 8. Ditto	Another shock			Ditto.
- 11. Ditto	Ditto		July 11-13, violent storms at Stockholm, and over the Baltic to St. Petersburg.	Ditto.
- 21. Island of Martinique	A violent shock		M. Perrey gives the date July 24	Hertha, B. xii. S. 182.
P.M. 5. Ditto	Two more severe shocks.			Monthly Magazine, April 1828, p. 429; Revue Encycl. Fév. 1828.
A.M. 6. New Albany, on the Ohio, in Floyd county, Indiana.	A slight shock.			Columbus, Nov. 1827, S. 145.
- 7. Ditto	Another shock, more severe than the last. The quick agitation of the earth, like ebullition, lasted		A forge was thrown down, but otherwise no damage was done. This is said to have been the second earthquake of the year, but the date of the first is not given.	Ditto.

327. Aug. 14. Palermo 2 P.M.	one on the morning of the 9th. Several oscillatory shocks, which suc- ceeded each other at very short inter- vals for about eigh- teen minutes.			Phil. Mag. N. S. vol. iii. p. 463; Poggendorff's Annalen, B. xxiv. S. 34.
— 23. New London in Con- necticut, United States. 10 P.M.	An earthquake		Accompanied by a noise like the rolling of a heavy wagon, the noise increasing for three or four seconds, and then decreasing for an equal time.	Columbus, Decr 1827, S. 197.
— Sept. 18. Lisbon	A slight shock			Journ. des Débats, 8 Oct.; Ann. de Chim. et de Phys. t. xxxvi. p. 398.
— 25. Island of Martinique	Another shock			Revue Encycl. 1828, Fév.; Hertha, B. xii. S. 182.
— 30 <sup>th</sup> A.M.	Two more shocks			Bull. de la Soc. Géol. t. vii. p. 21.
— 26. Ditto	Ditto			Ditto.
— Fort Kolitaran near La- hore, Hindostan. Some day of this month before the 26th.			The fort was destroyed, and about a thousand persons perished beneath the ruins. A hill was shaken down, which falling into the river Rowée, produced an inundation of a hundred Coss of land.	Madras Gazette, 26 Sept. 1827.
— Oct. 2. Island of Martinique	Another shock			Revue Encycl. 1828, Fév.; Hertha, B. xii. S. 182.
— 4 P.M.	A rather severe shock			Constitutionnel, 21 Oct.; Ann. de Chim. et de Phys. t. xxxvi. p. 398.
— 10. At Zürich, and all along the shore of the lake. 9 <sup>h</sup> 48 <sup>m</sup> P.M.				Allgemeine Zeitung, 1827, Nr. 327. S. 1308.
— 11. Ismail, Tutschkow, and Kischenew, in Bea- sarabia. 8 P.M.	Two slight shocks with a very short interval.			
— 15. Jassy in Moldavia 0 <sup>h</sup> 55 <sup>m</sup> P.M. 8 <sup>h</sup>	Two rather violent shocks, with an in- terval of but a few seconds. The mo- tion was horizontal, from N. to S.		Accompanied by subterranean noise. No damage done. The air had been very warm for seven- ral days. On the 14th at noon the thermo- meter stood at 24° 1 R. in the shade. The Allgemeine Zeitung gives the date October 14, while the other authorities quoted give the 15th as the day.	Allgemeine Zeitung, 1827, Nr. 303. S. 1212; Phil. Mag. N. S. vol. iii. p. 463; Ann. de Chim. et de Phys. t. xxxvi. p. 398.

1.	2.	3.	4.	5.	6.
Oct. 20. on.	Tiflis in Georgia. Also at Stavropol in the Caucasus.	A severe shock. Including the accompanying noise, the phenomenon lasted more than forty minutes (?). Direction = S.E. to N.W. At Stavropol 4 shocks were felt, the first being the most severe. At Tiflis six more shocks were felt before the 23rd, and others at frequent intervals up to the 1st of February following.		Accompanied by a dull noise. The weather was calm, and the temperature $+17^{\circ}$ R. Some walls were cracked by one of the subsequent shocks. This earthquake was probably also felt, though slightly, at Erivan.	Ann. de Chim. et de Phys. t. xxxix. p. 406; Férussac, Bull. des Sc. Nat. t. xiv. p. 44; Journ. des Débats, 9 Déc.; Moniteur, 10 Déc.
— 21.	Lunrøe in Norway .....	Another shock .....	.....	.....	Bull. de la Soc. Géol. t. vii. p. 21.
— 23.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 25.	Ditto .....	Ditto .....	.....	.....	Ditto.
— 30. 30 <sup>m</sup> A.M.	In the Cantons of Taverro, Talano, and Sartene in Corsica.	Two shocks .....	.....	.....	Constitutionnel, 27 Nov.; Ann. de Chim. et de Phys. t. xxxvi. p. 398.
Nov. 16. out 6 P.M.	In Columbia, S. America, on a line from N.E. to S.W., from Sta Fé-di-Bogota to Pasto, and thus parallel to the chain of the Andes. Whether felt to the east of the Andes or not, is not to be learned from the accounts.	A violent and widely-extended earthquake. The first shock came very suddenly, and was followed by an undulatory movement of the ground, lasting forty or fifty seconds, after which there came again a short violent shock. In Popayan the undulatory motion lasted three or four minutes, the direc-	.....	This earthquake was more destructive than the more violent one of 1826, from its duration and the character of the motion. In Bogota, Neyva, Popayan, Parace, and in fact all the towns and villages shaken, the damage was terrible, the houses crumbling into ruins everywhere. The destruction was greatly increased by the overflowing of several of the rivers, as the Magdalena, Cauca, &c., partly caused by heavy rain at this time, and partly by the falling in of banks and the hills overhanging the rivers. Great clefts opened in the ground in some places, into one of which the river Tunza flowed. Violent detonations followed the shock, occurring at intervals of thirty seconds with wonderful regularity. From some of the	Moniteur, 1828, No. 44. p. 71, No. 71. p. 293; Férussac, Bull. des Sc. Nat. t. xvii. p. 356; Ann. de Chim. et de Phys. t. xxxix. p. 406, t. li.; Phil. Mag. N. S. vol. iv. p. 56; Allgemeine Zeitung, 1828, Nr. 58. S. 229, quoting the Journal of Bogota, El Constitucional.

1827. Nov. 17. 9 A.M. (6 P.M. of the 16th, at S <sup>a</sup> Fê-di-Bogota, would correspond to 8 <sup>h</sup> 40 <sup>m</sup> A.M. on the 17th at Ochozk.)	Ochozk on the eastern coast of Siberia.	tion being S.E. to N.W. At this place the earth seemed much disturbed during the whole of the 16th and following night, and shocks of more or less severity were felt every forty or fifty minutes, up to 5 A.M. on the 17th. Severe shocks, lasting five to seven minutes.	clefts quantities of gas were discharged, by which rats and serpents were found to be asphyxiated; and the Magdalena and Cauca for hours bore along masses of mud with them, smelling strongly of sulphuretted hydrogen.	Bremer Zeitung, 1828, Feb.	
5 A.M.	At Popayan, in the same district of Columbia, shaken on the 16th.	A shock of still greater severity than that felt at this place the evening before, followed by an oscillation or shaking motion of considerable duration. The shocks again became very violent. Another shock.....	.....	Authorities quoted above for the 16th.	
11 <sup>h</sup> 45 <sup>m</sup> A.M.	Ditto	.....	A great part of the town was ruined.....	Ditto.	
5 P.M.	Ditto	.....	.....	Ditto	
4 <sup>h</sup> 30 <sup>m</sup> A.M.	Ditto	According to some accounts this was the last shock here felt, according to others the motion of the earth continued up to the 21st.	On the 21st an eruption of the volcano of Parace began. Thick clouds of vapour are said to have been seen before and on the day of the earthquake, on the old volcano of Tocaima and on the mountains of Santa Anna in Marequito and Parama de Ruiz.	Ditto.	

1.	2.	3.	4.	5.	6.
1827, Nov. 21. In the valley of Lauterbrunn, Canton of Berné.		A severe earthquake.			Kastner's Archiv, B. xiv. S. 234.
— 22. Lunrøe in Norway		Another shock.			Bull. de la Soc. Géol. t. vii. p. 21.
— 24. Ditto		Ditto			Ditto.
— 29. Ditto		Ditto			Ditto.
— 30. Islands of Martinique, Guadeloupe, Marie Galante, Antigua, and St. Domingo. Also said to have been felt in Terra Firma, South America.		A violent shock of thirty or forty seconds' duration. Direction E. to W., or according to others, S. to N. In Martinique it was vertical, and the most severe shock there remembered. This is said to have been the tenth earthquake in the West Indies within six months.	Also felt at sea, 100 leagues to the W. of Martinique, on board the ship 'Le Martiniquois,' in a place where shoals are marked on the charts. All the vessels near Pointe à Petre, and in the roadsteads of St. Pierre and Port Royal, also experienced the shock.	Preceded in some places, as in Guadeloupe, by a violent squall of wind. In Martinique buildings were thrown down.	Moniteur, 1828, Nr. 13. p. 51, No. 43. p. 169, No. 57. p. 238; Ann. de Chim. et de Phys. t. xxxvi. p. 398; Phil. Mag. N.S. vol. iii. p. 463; Hertha, B. xii. S. 183.
— Dec. 1. Island of Martinique		Another shock, accompanied by undulatory motion.			Hertha, B. xii. S. 183, quoting Revue Encycl.
— 10 A.M.		Ditto			Ditto.
— 3 <sup>h</sup> 15 <sup>m</sup> P.M.		Shocks.			Kastner's Archiv, B. xiv. S. 234.
— 3. In Sweden		Another shock, accompanied as before on December 1, by undulatory motion.		Immediately followed, as had been some of the other shocks of the few days preceding, by rain. On the 9th a remarkable volcanic eruption, accompanied by shocks of considerable violence but small extent, took place near the village of Jokmali in the province of Bakon on the Caspian Sea. Vide v. Hoff.	Hertha, B. xii. S. 183, quoting Revue Encycl.
— 8. Island of Martinique				Accompanied by a dull noise. Church bells were made to toll, and the walls of the houses cracked. Dogs howled before the shocks. In the afternoon of the same day an extraordinary noise was heard on the lake of Salungen in	
— 3 <sup>h</sup> 30 <sup>m</sup> , 4 <sup>h</sup> A.M.		The shocks were from W. to E. The one at 3 <sup>h</sup> 30 <sup>m</sup> was followed, six seconds later, by two more			Moniteur, 13 Fév. 1828; Férussac, Bull. des Sc. Nat. t. xviii. p. 312; Poggenhoff's Annalen, B. xix. S. 460.

		vibrations.		
1827. Dec. Night between 21 and 22. (Probably at 2 and 3 A.M. on the 22nd.)	Friburg, Berne, &c. on v. the Upper Rhine.	Four shocks from W. to E. at the hours given in Col. 1, but does not say where they were felt. The account probably refers to the places here given.	Saxony. A similar phenomenon had been there remarked on the 1st of November, 1755, the day of the great earthquake of Lisbon.	Communication of M. Studer to M. Perrey; Kastner's Archiv, B. xiv. S. 234.
— (Four years after the eruption of Austur-Jökull in 1823.)	In the neighbourhood of the volcano Austur- Jökull in Iceland.	An earthquake		Voyage en Islande, partie Géol. p. 214.
1828. Jan. 3. After noon.	Aquila in the Abruzzo, kingdom of Naples.	Two shocks from S.E. to N.W.		Kastner's Archiv, B. xiv. S. 236.
— — — 12.	Lunroe in Norway.	Another shock.		Keilhau.
— — — 12.	Near Hohen-Memmin- gen, about half a mile E.N.E. from Giengen, in Swabia.	A slight vibratory shock from N.W. to S.E.	The weather was unsettled. The thermometer stood before noon at +5°, after noon at +6°·7 R. During the following night a vio- lent storm raged in the Channel and on the S. and E. coasts of England, felt later at Nu- remberg and in Thuringia.	Schweigger's Jahrb. t. xxix. (lix.) S. 34; Correspondenzblatt d. Würt- temb. Landwirths. Vereins. Sept. 1829. S. 170.
— — — 14. 11 <sup>h</sup> 45 <sup>m</sup> P.M.	Venice	Slight undulatory shock from S. to N.E. (?), lasting 2 seconds.	After the motion had ceased a prolonged dull noise was heard in the air. The weather was dark and stormy. Walls were cracked.	Kastner's Archiv, B. xiii. S. 71; Ann. de Chim. et de Phys. t. xxix. p. 408; Journ. des Débat, 26 Janv.
— — — 16.	Gross Kostely in the county of Krasova, Hungary.	An earthquake	Preceded by a severe thunderstorm, lasting an hour and a half.	Leonhard's Zeitschrift, 1828, S. 651.
— — — 10 <sup>h</sup> 15 <sup>m</sup> A.M.	Ohnastetten in the baili- wick of Urach, 2700 feet above the level of the sea, and Unter- hausen in the adjoining valley of Honau,	A pretty smart shock from W. to E., last- ing about 2 secs.	Accompanied by a heavy subterranean noise, like a distant cannonade. Windows rattled, un- fastened sashes swung to, articles of furniture were moved from their places, &c. The baro- meter at Ohnastetten fell about 3 lines soon after the shock. At Tübingen it was 4 lines	Schweigger's Jahrb. t. xxix. (liv.) S. 34; Corresp. d. Würtemb. Land- wirths. Vereins. Sept. 1829. S. 170, 171.



1.	2.	3.	4.	5.	6.
1828, Feb. 2. 10 <sup>h</sup> 15 <sup>m</sup> A.M.	near Tübingen, Swabia	One of the most violent of modern earthquakes, though confined to but a limited district. Slight movements had been felt at 3 A.M. at Forlì, Faenza, and Imola, in the States of the Church, and at Foglio, San Severo, Barletta Bani, and some other places in the kingdom of Naples. In the last-named place the motion was from E. to W., and began about 7 A.M. The earthquake in Ischia consisted of an undulatory shaking motion, lasting 4 secs.	The sea was quite calm, and remained so all day.	above the mean height, and fell 2 lines before the following morning, the weather remaining calm and clear. Preceded by no remarkable phenomenon, except that in the morning Vesuvius sent forth smoke, and afterwards flame and stones. The springs exhibited no change, except that of Rita, the temperature of which was slightly altered. Immediately before the shock, in the space of 3 secs., three loud explosions were heard, which appeared to come from beneath upwards, or from the interior of the Epomeo outwards. These explosions were very remarkable along the coasts of Casamicciola, Lacco, and Forio; but in the interior of the island, where the shock was most severe, they were scarcely remarked. The part of the island which suffered most lies west of Casamicciola, between Fango and Casamello, the shock apparently passing from the Epomeo thither. In Casamicciola a part of the buildings fell together to the ground, and twenty-eight men were killed and many injured. In Serrafontana, Forio, and Testaccio no damage was done, but Lacco suffered remarkably. The barometer had been higher in the middle of January than for six years before.	Allgemeine Zeitung, 1828, Nr. 61. S. 243; Covelli in the Journal II Pontano, Nr. 2; Biblioth. Univers. Oct. 1828, p. 157; Kastner's Archiv, B. xiv. S. 327.
— — — — —	4. Tabasco, about 200 miles E.S.E. of Vera Cruz, Mexico.	A violent earthquake.	.....	The roofs of the churches and the prison were destroyed, and the bank of the river Tabasco sank 30 feet. Villa Hornosa, a town 7 miles higher up the river, was almost entirely reduced to a heap of ruins.	Columbus by Rüdiger, B. ii. S. 140.
— — — — —	6. Lauröe in Norway .....	Another shock	.....	During a profound calm. Subterranean noise accompanied the shock. The houses were strongly shaken, tables, chairs, &c. were shaken about and for some without effect.	Keilhau, Schweigger's Jahrb. t. xxix. (lix.) S. 35; Corresp. d. Würtemb. Landwirths. Vereins. Sept. 1829,
— — — — — a 30 <sup>m</sup> P.M.	8. Again in the district of the Swabian Alps, shaken on the 29th January, hut over a	Another shock, of greater violence than that of Jan. 29. It lasted 3 or 4 secs.	.....		

1828. Feb. 13.	Reutlingen, S.W. to Tuttlingen, N.W. to Tuttlingen, and most severely in Kohlketten, Gross- and Klein-Engstingen, Hobbelfingen, and Ohnastten on the mountains.	Another shock	Another severe shock.	earth was sinking under them. In Tübingen the motion was very distinctly felt in many parts of the town. The barometer at that place stood at about the mean height, and fell on the day of the earthquake and the following 3 lines, but no storm or rain ensued. Herr Schüller remarks, that both this shock and that of the 29th January proceeded from the same chain of mountains, which in this district is often intersected by basaltic formations.	Keilhau.	Authorities quoted under Feb. 2.
14.	Island of Ischia	Another severe shock.	Several slight shocks.	Some buildings on the plains of Casamicciola were ruined.	Der Freimüthige, 1829, Nr. 54. S. 216.	
—	A Manilla in Luçon, Philippine Isles.	Another severe shock.	Several slight shocks.	The eruption of the volcano of Albay, which began in June 1827, still continued.	Journ. des Débats, 1 et 28 Mars; Constitutionnel of same dates; Moniteur, 27 et 28 Fév., 1 et 28 Mars; Ann. de Chim. et de Phys. t. xxxix. p. 408; Ferrussac, Bull. des Sc. Nat. Mars 1829, Mai 1830; Allgemeine Zeitung, 1828, Nr. 65; S. 260; Phil. Mag. N. S. vol. iv. p. 55; Kastner's Archiv, B. xiii. iii. 78; Poggenдорff's Annalen, B. xii. (lxxxviii.) S. 331, xlii. (lxxxix.) S. 153; Schweigger's Jahrbuch, B. xxiii. (liii.) S. 1.	
—	In Belgium, the north of France, and the basins of the Meuse, Rhine, and Moselle. According to v. Höff, the limits of this earthquake were, to the S., Longuyon and Commercy; to the S.W., Wavres, Le Quesnay, Dunkirk, and Bruges; to the N.W., Middelburg and Flushing; to the N., Dordrecht and Uppenberg; to the E., as far as the Rhine, and even beyond it. The district most violently disturbed lies between Ath and Maestricht, and Namur and Louvain.	Another severe shock.	Several slight shocks.	At Liège the weather was quite calm. The shocks there felt were accompanied by a dull noise. The houses shook, and articles of furniture exhibited a very marked oscillatory motion. Some chimnies were thrown down. The motion was most felt in the upper stories of the houses. It was also felt in the coal-pits, in one of which a rolling noise was said to have been heard. The barometer remained as before the shocks, at 27 inches 1 line. At Maestricht, Tirlémont, Dunkirk, &c. chimnies were thrown down, walls cracked, glass and china broken, and furniture moved about. Some magnetic perturbations are said to have preceded or accompanied the earthquake. Thus at Cologne, on the 23rd, a variation of four degrees to the west was observed. On the 21st the barometer was unusually low at Geneva, Coburg, and other places; and on the 19th, 20th, 21st, 22nd, and 23rd, terrible storms raged over the centre of Europe. The earthquake was felt at almost all the places included within the limits given in column 1, as Mons, Namur, Louvain, Aix-la-Chapelle, Hainaut, Dusseldorf, Cologne, Bonn, Rema-		
—	short time before the 16th.	Another severe shock.	Several slight shocks.	At Liège the weather was quite calm. The shocks there felt were accompanied by a dull noise. The houses shook, and articles of furniture exhibited a very marked oscillatory motion. Some chimnies were thrown down. The motion was most felt in the upper stories of the houses. It was also felt in the coal-pits, in one of which a rolling noise was said to have been heard. The barometer remained as before the shocks, at 27 inches 1 line. At Maestricht, Tirlémont, Dunkirk, &c. chimnies were thrown down, walls cracked, glass and china broken, and furniture moved about. Some magnetic perturbations are said to have preceded or accompanied the earthquake. Thus at Cologne, on the 23rd, a variation of four degrees to the west was observed. On the 21st the barometer was unusually low at Geneva, Coburg, and other places; and on the 19th, 20th, 21st, 22nd, and 23rd, terrible storms raged over the centre of Europe. The earthquake was felt at almost all the places included within the limits given in column 1, as Mons, Namur, Louvain, Aix-la-Chapelle, Hainaut, Dusseldorf, Cologne, Bonn, Rema-		
—	About 8 <sup>h</sup> 20 <sup>m</sup> A.M.	Another severe shock.	Several slight shocks.	At Liège the weather was quite calm. The shocks there felt were accompanied by a dull noise. The houses shook, and articles of furniture exhibited a very marked oscillatory motion. Some chimnies were thrown down. The motion was most felt in the upper stories of the houses. It was also felt in the coal-pits, in one of which a rolling noise was said to have been heard. The barometer remained as before the shocks, at 27 inches 1 line. At Maestricht, Tirlémont, Dunkirk, &c. chimnies were thrown down, walls cracked, glass and china broken, and furniture moved about. Some magnetic perturbations are said to have preceded or accompanied the earthquake. Thus at Cologne, on the 23rd, a variation of four degrees to the west was observed. On the 21st the barometer was unusually low at Geneva, Coburg, and other places; and on the 19th, 20th, 21st, 22nd, and 23rd, terrible storms raged over the centre of Europe. The earthquake was felt at almost all the places included within the limits given in column 1, as Mons, Namur, Louvain, Aix-la-Chapelle, Hainaut, Dusseldorf, Cologne, Bonn, Rema-		

2.	3.	4.	5.	6.
ab. 24. Washington and Baltimore in the United States.	minute. At Avesnes the shock was from E. to W., equally strong, but of shorter duration. At Dunkirk the direction of the motion was variously reported; it was most generally given as S. to N. At Brussels the shock was exceedingly slight, though situated near the centre of the disturbed district.		gen, Coblenz, &c. &c. For a long account of this earthquake vide v. Hoff's 'Chronik.'	
— 26. Upbergen and Beck near more in the United States.	A violent shock		v. Hoff remarks that, although the hour at which this shock was felt is not given, if the day be correctly recorded the present shock cannot have been simultaneous with that in Belgium.	Hertha, B. xii. S. 100.
ar. 1. Lunroe in Norway	A slight shock from S. to N., lasting 2 secs.		In all probability this is but an account of the shock of the 23rd, mistaken as to day. Nöggerath believes this to be the case.	Arnheimer Zeitung, 27 Feb.
— 3. Ditto	Another shock			Keilhau.
— 4. Ditto	Ditto, severe			Ditto.
— 5. Ditto	Two shocks			Ditto.
— 6. In the West Indies (which island or islands?)	Some other very feeble shocks.			Ditto.
— 7. A.M.	A slight shock from E. to W.			Ann. de Chim. et de Phys. t. xxxix. p. 410.
— 9. Washington and some of the neighbouring towns.	Two severe shocks, lasting together not quite 30 secs. The first was stronger than the second.		Accompanied by a noise like the rolling of heavy waggons over pavement. People were awakened by the shocks and sprang out of bed.	Monthly Magazine, 1828, August, p. 202; Ann. de Chim. et de Phys. t. xxxix. p. 410.

ing days.						
22. 0 <sup>h</sup> 20 or 30 <sup>m</sup> A.M.	Jauche, Jandrin, Jandre-nouvelle, and more slightly at Louvain, in Belgium.	A shock of 3 seconds' duration.	.....	Possibly nothing more than an account of the event of Feb. 23, wrongly given as to date.	Chim. et de Phys. t. xxxix. S. 424, &c. Schweigger's Jahrbuch, xxiii. (liii.) S. 45.	
About 2 A.M.	On the Dürrenberg, near Strehla on the Elbe, and the neighbourhood.	A remarkable shock.	.....	Accompanied by rolling noise. The evening before, a warm wind blew from the south, with thunder-clouds and heavy rain. At the time of the shock there was a storm, and though thunder-clouds were to be seen in the north, in the zenith the sky was clear. On the 21st a large landlip took place on Mont Cerisier, near Audenaerden in Belgium, by some considered as a consequence of the late earthquake in that country. Moniteur, 1828, no. 93. p. 394; Schweigger's Jahrbuch, B. xxiii. (liii.) S. 49.	Ditto, quoting Berliner Vossischen Zeit. Mitth. d. Statist. Vereinsins Königreich Sachsen. Lief. xi. p. 42.	
23. About 9 <sup>h</sup> 30 <sup>m</sup> A.M.	Le Quesnoy and Jauche in Belgium.	A severe shock, from beneath upwards.	.....	Unaccompanied by noise. <i>Possibly</i> but the same with the event of Feb. 23, wrongly reported as to date.	Moniteur et Constitutionnel, 27 et 28 Mars; Ann. de Chim. et de Phys. t. xxxix. p. 410. Morgenblatt, 1828, Nr. 253. S. 1012.	
29. 4 <sup>h</sup> 30 <sup>m</sup> A.M.	Island of Martinique	A prolonged vibration from E. to W.	.....	.....	.....	
30. 7 <sup>h</sup> 32 <sup>m</sup> A.M.	In Peru. Extended but a short distance south of Lima and Callao. It was felt at Arequipa, but not at all at Arica. To the north, however, it was perceived at Surras, Huancoco, and even Truxillo.	A very violent earthquake, probably passing from the chain of the Andes out to sea. In Lima the shocks lasted according to some 29, according to others 40 seconds. In Callao they recurred during 3 min. At 49 min. after midnight another shock, but of short duration, occurred.	Some of the phenomena observed on board a ship in the harbour of Callao were very remarkable. On board the 'Volant,' about half-past seven, a noise like distant thunder was heard, and then came a shock, compared to jolting over a rough road in an ill-constructed cart, or to	Great damage was done. Scarcely a house in Lima or Callao remained uninjured, and walls of 6 and even 9 feet thick were thrown down. The cloud of dust which arose from the ruined buildings of Lima was seen at Callao before the shock itself was felt there. At Surras streams of water burst forth from the earth. At Truxillo and elsewhere in the northern part of the district shaken, the most extraordinary and violent rain followed, lasted four days, and produced most disastrous inundations. On board the ship 'Volant' the shock is said to have been felt <i>before</i> it was perceived on shore, while the accounts from other vessels agree in saying that the earthquake was first felt on the land.	Moniteur, 1828, no. 254. p. 1435; Galiguani's Messenger, 30 Aug.; Allgemeine Zeitung, 1828, Nr. 224, 237 u. 250; Ann. de Chim. et de Phys. t. xlii. p. 416, quoting the Globe; Morgenblatt, 1829, Nr. 238; Ferrussac, Bull. des Sc. Nat. t. xvii. p. 354.	

2.	3.	4.	5.	6.
	<p>3. curred; and during the six following days others were felt.</p>	<p>4. the vessel striking upon rocks or sandbanks. The water, which was 25 fathoms deep, hissed and boiled as if red-hot iron had been thrown into it, and the surface was covered with bubbles of gas of a sulphurous odour, and quantities of dead fish. The sea had been quite clear, but was now disturbed and muddy. The ship swung to the extent of 14 in. on either side. On weighing anchor, the chain cable of one of the anchors was found to be half melted in a considerable part of its length, the links being drawn out also lengthways. The chain of the second anchor was quite uninjured, as were those of all the other ships in the bay.</p>		
<p>April 4. Santiago in Chili</p>	<p>..... A severe vibratory shock.</p>			<p>..... Ann. de Chim. et de Phys. t. xlii. p. 407.</p>
<p>— Forth in the States of the Church, and more so to 10.</p>	<p>..... Eighteen shocks at Forth during these</p>			<p>..... Constitutionnel, 29 Avril; Ann. de Chim. et de Phys. t. xxxix. p. 419;</p>

[illegible]

1.	2.	3.	4.	5.	6.
June 15. Marsala in Sicily.....		An undulatory shock.		About the end of the month there was an eruption of gas or vapour in the island of Iachia.	Bibl. Univ. Mai 1831, p. 85.
— between July 4. Poitiers in the departm. of Vienne.		A slight shock.			Journ. des Débats, 27 Juin; Ann. de Chim. et de Phys. t. xxxix. p. 411.
— 9 <sup>th</sup> P.M. Sanflago in Chiff.....		A severe shock.			Ann. de Chim. et de Phys. t. xlii. p. 407.
— 1 <sup>st</sup> A.M. Island of Martinique.....					Froriep's Notizen, B. xxii. Nr. 7. (469.) S. 106.
— 20. Bhud in the East Indies (in Hindostan?).		A violent shock from E. to W.		Water was thrown out of glasses which were half-full. The sky was clouded, and in the afternoon it rained heavily.	Ann. des Voyages, 1829, Mai, p. 248, quoting the Asiatic Journ.; Leonhard u. Bronn, N. Jahrbuch, 1833, S. 125.
— 21. Alt-Schamachi in the Caucasus, 80 or 90 wersta from Baka, at which place the shocks were not felt.		An earthquake. Five shocks were felt in three days.			Authorities quoted below for this place, under August.
— 26. Coire in the Grisons, Switzerland.					
— 29. Island of Martinique.....					Communication of M. Studer to M. Perrey.
Aug. 6. Schouscha in Georgia... in after night (of 4th?).		Several shocks, continuing until morning. Three more shocks were felt during the day, and two others before 1 o'clock the following night.		Froriep's 'Notizen,' here quoted, mentions a disastrous earthquake at Lima on the 30th July, but doubtless it refers to the 30th March. Preceded by continuous rain and violent wind.	Froriep's Notizen, B. xxii. Nr. 7. (469.) S. 106.
— Kouba, in the same district of the Caucasus.		Two rather severe shocks, followed by a slight one about			Journ. des Débats, 15 et 21 Oct.; Moniteur, 30 Oct.; Férussac, Bull. des Sc. Nat. t. xvii. p. 352 t. xvi. p. 31; Ann. de Chim. et de Phys. t. xxxix. p. 411, t. xlii. p. 417; Gauguani's Messenger, Oct. 22; Allgemeine Zeitung.
— between 18.					Ditto.

DATE AND TIME	PLACE	DESCRIPTION OF PHENOMENA	REMARKS
10. 1 <sup>st</sup> 55 <sup>m</sup> A.M.	Santiago in Chili	Another severe shock.	Ann. de Chim. et de Phys. t. xlii. p. 407.
13. Between 1 <sup>st</sup> 30 <sup>m</sup> and 2 <sup>nd</sup> A.M.	In Belgium. Felt at Brussels, but no other places mentioned.	Two slight shocks	Accompanied by remarkable subterranean noise. Kastner's Archiv, B. xiv. S. 392.
14. In the morning.	Santiago in Chili.	Another severe vibratory shock.	Ann. de Chim. et de Phys. t. xlii. p. 407.
Between noon and 1 P.M.	Again at Schouacha in Georgia.	Two more shocks. Six of those felt at this place were very severe, and lasted a minute each.	Ditto, t. xxxix. p. 411, and other authorities quoted above.
20. St. Paul de la Valtre in Canada.	St. Paul de la Valtre in Canada.	A shock	Corresp. d. Würtemb. Landw. Vereins. 2 Heft, 1829, S. 115.
25. 11 <sup>th</sup> 40 <sup>m</sup> P.M.	Santiago in Chili.	Another severe vibratory shock.	Ann. de Chim. et de Phys. t. xlii. p. 407.
Sept. 10.	Palermo	A shock	Poggendorff's Annalen, B. xxiv. S. 54.
13.	In the kingdom of Murcia, Spain.	The first shock of the earthquakes of the 15th.	Moniteur, 20 Oct.; Journ. des Débats, 5 Oct.; Constitutionnel, 9 Oct.; Ferrusac, Bull. des Sc. Nat.

ing villages great numbers of buildings were utterly ruined, and others more or less injured. The village of Mongalou was buried beneath a great landslip (brought down by the earthquake). Three large springs burst forth where the soil had been torn away from the surface of the mountain. After the earthquake the streams are said to have been more or less swollen. Half of the village of Ischagana was swallowed up by the earth. In several places fissures and new springs made their appearance. At the village of Sahiany a fissure was observed of nearly 3 feet in width and 2½ wersts long. During the night a light appeared above it like lightning.

Ann. de Chim. et de Phys. t. xlii. p. 407.

Accompanied by remarkable subterranean noise. Kastner's Archiv, B. xiv. S. 392.

Ann. de Chim. et de Phys. t. xlii. p. 407.

Ditto, t. xxxix. p. 411, and other authorities quoted above.

Corresp. d. Würtemb. Landw. Vereins. 2 Heft, 1829, S. 115.

Ann. de Chim. et de Phys. t. xlii. p. 407.

Poggendorff's Annalen, B. xxiv. S. 54. Moniteur, 20 Oct.; Journ. des Débats, 5 Oct.; Constitutionnel, 9 Oct.; Ferrusac, Bull. des Sc. Nat.



1.	2.	3.	4.	5.	6.
1828. Sept. Night between 14 and 15. 5 <sup>h</sup> 16 <sup>m</sup> A.M. The most violent shock at 5 P.M.	Murcia and some other towns in that pro- vince, and in Valencia. Ditto. The principal centre of disturbance appeared to be on the coast, and beneath the villages of Torrevieja and Guardamar.	A violent shock ..... The earthquake took the direction N.W. to S.E. At 6 <sup>h</sup> 15 <sup>m</sup> it recommenced with less violence, and again recurred at 3 <sup>h</sup> 30 <sup>m</sup> the fol- lowing night. The principal shock at 3 P.M. was follow- ed by 300 others within twenty-four hours, and frequent oscillations were experienced still later, which kept the inhabitants in a constant state of alarm up to March 1829. At Torre- vieja and Guarda- mar eleven violent shocks were felt on this day.	Some damage was done, especially at Lorca, Ori- huela, and Torrevieja. At Torrevieja, Guardamar, and La Mata many houses were thrown down and others injured. The water in some of the wells overflowed, while in others it disappeared. In some places loud subterranean noises were heard. On the 14th there had been an extraordinary storm in Catalonia, accompanied by hail of most un- usual size.	t. xviii. p. 201; Ann. de Chim. et de Phys. t. xxxix. p. 411, t. xlv. p. 396, &c. Ditto.	
18. Calcutta ..... 7 A.M.	Two severe shocks. The motion was in a vertical direc- tion.	Articles of furniture were thrown up into the air. The atmosphere was quite calm, but heavy and thick.	Ann. de Chim. et de Phys. t. xlii. p. 407.		
23. Santiago in Chili..... 10 <sup>pm</sup> P.M.	A rather severe shock.				
54 Casimirofola in the A vibration					

1828. Oct. 1. In the morning.	1. Island of Gran-Canaria, Canary Isles.	A violent earthquake.	Felt on board vessels in harbour as if they had touched the bottom.	Many buildings were greatly injured	.....	Moniteur, 20 Déc.; Ann. de Chim. et de Phys. t. xxix. p. 411; Pécussac, Bull. des Sc. Nat. t. xvii. p. 353.
11 <sup>h</sup> 40 <sup>m</sup> A.M.	5. Ceens in the States of the Church.	A slight shock.	.....	.....	.....	Ann. de Chim. et de Phys. t. xxix. p. 411.
10 <sup>h</sup> 44 <sup>m</sup> and 11 <sup>h</sup> 45 <sup>m</sup> P.M.	8. Pessaro in the States of the Church. Also slightly at Genoa.	Slight shocks. The same night (?) slight shocks were also felt at Verona, Lucca, Florence, Novi, and Pignerol.	.....	.....	.....	Ditto, p. 412.
(v. Hoff gives the hours 10 <sup>h</sup> 45 <sup>m</sup> and 11 <sup>h</sup> 25 <sup>m</sup> ). At Genoa, about 10 P.M.	9. Genoa and Turin.	Also violent oscillatory shock, lasting at Genoa 20 seconds, at Turin 30. At Genoa another shock about 8 <sup>h</sup> 30 <sup>m</sup> A.M.	In the harbour of Genoa very considerable motion of the sea was produced, so that vessels struck against each other.	In Genoa small bells were set in motion, and clocks stopped. Some buildings were injured by great cracks, and the damage done by the fall of others was very considerable.	.....	Ditto; Constitutionnel, 16, 18 et 19 Oct.; Moniteur et Journ. des Débats, 18 et 20 Oct.; Studer; Férussac, Bull. des Sc. Nat. t. xviii. p. 200, t. xxvi. p. 31; Allgemeine Zeitung, 1828, Nr. 290. S. 1159, Nr. 308. S. 1231.
About 1 <sup>h</sup> 30 <sup>m</sup> or 2 A.M.	10. Ditto, at Turin, Vercelli, Asti, Voghera, &c.	Two slight shocks in the space of half an hour.	.....	.....	.....	Ditto.
	More strongly felt on the right bank of the river Po than on the left. The limits of the earthquake of these three days were, Marsailles and a curve joining Vercelli, Voghera, and Genoa, being most violently felt between the two last-named places.	.....	.....	Several persons said that they had seen a luminous meteor shortly before the shock. The province of Bobbio, and especially the valley of Stalfora near Voghera, suffered most by this earthquake of the 8th, 9th, and 10th. Many villages were ruined in this district. The weather was very mild, and remained unusually so until the end of December.	.....	
2 A.M.	20. In the valley of Nepal, and further south.	A violent shock, followed by eight alighter ones. The	.....	The weather had been changeable for twenty-four hours before the earthquake. Soon after it became fine. At Catmandou and Patna	.....	v. Hoff, quoting no authority.

1.	2.	3.	4.	5.	6.
		first came from beneath upwards; no horizontal motion was then observed, but the succeeding undulations were from S. to N. During the next night some more oscillations.		some buildings were thrown down. The oscillations felt during the following night were accompanied by loud noise.	
Oct. ...	In Murcia and Valencia, in Spain.	Several more shocks in the course of the month.			Authorities quoted above, 13th Sept.
Nov. 11. M.	San-Severo and Serrapicola in the kingdom of Naples.	A slight shock		On the evening of the 17th a new crater opened on Vesuvius.	Férussac, Bull. des Sc. Nat. t. xix. p. 209.
— 16. M.	In Columbia, S. America.				Huot, Géologie, p. 116.
— 17. M.	Island of Martinique	Two shocks			Cuvier, Hist. des Sc. Nat. t. v. p. 63.
— 21. 10 <sup>th</sup> A.M.	In the district of Reiffenberg, near Frankfurt on the Maine.	A vibratory shock		Accompanied by subterranean rolling noise	Morgenblatt, 1829, Nr. 45. S. 180, quoting an unpublished lecture of Dr. Böger of Frankfurt.
— 25.	The district between Frankfurt and Mayence. Not felt to the north of the Taunus Mountains.	Ditto		Perhaps only the same with the preceding or following accounts.	Journ. des Débats, 8 Janv. 1829.
— 26. 10 <sup>th</sup> P.M.	Sindlingen in Nassau, 6 or 7 (German?) miles N.W. of Frankfurt.	Ditto, violent, from E. to W.			Kastner's Archiv, B. xv. S. 244.
— 27. 4.	Bonn on the Rhine.	Another similar shock, also from E. to W.			Ditto.
Dec. 3. 1 <sup>st</sup> P.M.	Very widely extended. In the eastern parts of Belgium, in Lorraine, and on the Rhine, principally in a line running nearly N. and S., from Metz to Aix-la-Chapelle and other places mentioned.	Very severe at Aix-la-Chapelle and other places mentioned. Very slightly felt at Maestricht and Liège. Here and at Bonn, Remagen,	On this same day at Liège the barometer was very high, and remained so during and after the shock. At Remagen the shocks were accompanied by noise, and at Slavet and Malmédy very distinct explosions were heard. From the 1st to the 3rd terrible storms prevailed in the Baltic, Mediterranean, and Adriatic.		Journ. des Débats, Moniteur, Constitutionnel, 8, 9 et 23 Déc., 3 Janv. suiv.; Ann. de Chim. et de Phys. t. xxxix. p. 412; Kastner's Archiv, B. xv. S. 243 u. 429.

La-Chapelle. Most strongly felt at Aix-la-Chapelle, Burscheid, Malmédy, Spa, and Stavelot. Also perceived at Cologne, and as far as St. Wendel, ten miles N.E. of Metz.	and Dusseldorf two shocks were perceived, lasting at Liège forty or sixty seconds. At Aix-la-Chapelle the two first shocks, which lasted but two seconds, were from S.E. to N.W., and were followed by a third, the most violent which had been felt there for ten years. It was so also at Burscheid. At Remagen the direction of the first two was N.W. to S.E., the third was vertical. At Stavelot they lasted four or five seconds. At Siegburg and Pützchen near Bonn three shocks were also felt. At Vienna the two shocks were vertical, and only lasted a few seconds.	was probably owing solely to the storm.	Accompanied by a noise like thunder, which was heard some miles further to the east.	D. Milne's Catalogue, <i>loc. cit.</i> ; Foriep's Notizen, B. xiii. Nr. 21 (505). S. 828. Singapore Chronicle, Jan. 1, 1829; Corresp. d. Würtemb. Landw. Vereins. 4 Hef. 1829, S. 236. Corresp. d. Würtemb. Landw. Vereins. 2 Hef. 1829, S. 115. Constitutionnel, 8 Janv. 1829; Ann. de Chim. et de Phys. t. xxxix.
8. Dec. 9. Courrie in Perthshire ...	A shock, said to be the third within three months.			
— In the island of Luçon, especially at Manila.	A destructive earthquake. Lasted two minutes at Manila.			
— 11. In Georgia, United States.	A shock			
— 13. Sandgruben at the foot of the Schwendelberg.	A slight shock, followed, at 9 <sup>h</sup> 40 <sup>m</sup> , by		The second shock was accompanied by loud subterranean noise.	

1.	2.	3.	4.	5.	6.
	and at Gaggisberg ( <sup>1</sup> / <sub>2</sub> <sup>b</sup> from Reusschegg, on the way from Berne to Thun).	an extremely severe one.			p. 412.
Dec. 14. on and 2	Ditto .....	Two more shocks .....			Ditto.
— 16. y <sup>m</sup> or 45 <sup>m</sup> t.	Ditto .....	More shocks, lasting some seconds.			Ditto.
— put the bl.	In Murcia and Valencia, in Spain. Especially at Torreveja.	Severe shocks again, forced the inhabitants of Torreveja to leave their houses.			Authorities quoted above, 13th Sept.; Journal de Frankfurt, 1829, Nr. 14.
— 29. A.M.	Macassar in the island of Celebes, and along the south coast.	An earthquake, which lasted two minutes and a half at Macassar.	The sea rose several times to a fearful height, and ebbed and flowed with indescribable rapidity on the strand.	Bulecomba suffered much injury, and the plantations around Macassar were also greatly damaged.	Correspondenzblatt v. u. f. Deutschland, 1829, Nr. 270.
— ing the few days e month.	Country around Vesuvius.	Slight shocks .....		Accompanying a renewal of the eruption of March.	Forcip's Notizen, B. xxvi. Nr. 9 (359); Ann. de Chim. et de Phys. t. xlii. p. 347.
— .....	In New South Wales ...	A very severe earthquake, lasting five and twenty minutes (!).		Followed by a destructive tempest. Neither the exact date or locality given. I have not been able to find any confirmation of this account.	Ditto.
Jan. ning of month. -ight.	Portsmouth in the State of New York.	A slight shock .....			Prenus, Staatszeitung, 1829, Nr. 62, Bell.
— 4. y <sup>m</sup> A.M.	Berne and Freiburg ..				P. Mérian.
— evening.	Macassar in the island of Celebes.	Recurrence of shocks (vide 29 Dec.).		No damage done .....	Corresp. v. u. f. Deutschland, 1829, Nr. 270.
— 15.	Torreveja in Valencia, Spain.	Four more shocks. Other slight ones occurred from time		During the latter half of this month the eruption of Vesuvius was renewed, and became more energetic.	Authorities quoted under March 21.

1829. Jan. Almost every day between 2 and 3 P.M.	Alt-Schamachi in Georgia.	to time up to the 11th of March, when they suddenly ceased until the 21st.			Ann. de Chim. et de Phys. t. xlii. pp. 347, 417.
— (Some weeks before Feb. 8.) — Feb. 7. 6 A.M.	Patras in Greece..... Island of Martinique ...	Shocks almost daily felt at the period mentioned. Two shocks .....		Always accompanied by atmospheric disturbances (of what kind?).	Gothaische Zeitung, 1829, Nr. 50. Art. Rom.
— 21. and night be- tween 21 and 22.	Throughout the south of Iceland.	A vibratory shock, followed by others of less intensity on the ensuing days.		Great damage in the inhabited districts lying near Hecia. Some of the peasants' cabins were completely ruined, and others much in- jured. The winter of 1828-29, which was pretty severe in Europe, was so unusually mild in Iceland that scarcely any ice or snow was to be seen.	Ann. de Chim. et de Phys. t. xlii. p. 348; Cuvier, Hist. des Sc. Nat. t. v. p. 63 et 64; Constitutionnel, 1 Juin. Preuss. Staatszeitung, 1829, Nr. 104, Beil.
— 23.	Smyrna .....	Two shocks, of which one was very vio- lent. Both were horizontal, and in the direction N. to S. Some shocks were perceived.			Corresp. d. Würtemb. Landw. Ve- reins. 3 Heft. 1829, S. 186; Fö- russac, Bull. des Sc. Nat. t. xxvi. p. 32.
— End of the month. — Mar. 8. (N.S.) 4 <sup>h</sup> 10 <sup>m</sup> . (According to Erman, March 7, 16 <sup>h</sup> 28 <sup>m</sup> , or true time, or 16 <sup>h</sup> 40 <sup>m</sup> , mean time).	Stockholm .....				Corresp. d. Würtemb. Landw. Ve- reins. 4 Heft. 1829, S. 235.
	Irkutsk in Siberia, and from lat. 50° to 52° and 54°, or probably extended even further to the south, towards China. Felt at many places from Kiachta to Nischney-Udinak.	A severe shock from N.E. to S.W. At Ki- achta and Troïtako- Sawks it was so violent that the sen- tinals could scarcely keep their feet. In the fortresses of Tun- ka, south of Lake Baikal, the vibra-		At Kiachta and Troïtako-Sawks preceded by a noise like that of the wind in a storm. At Irkutsk Erman could not perceive any effect on the magnetic needle. At the fort Tunka the walls of wooden houses bent, and doors, &c. were forced open. A huge mass of rock on the right bank of the river Irkut fell; the earth opened in many places, and the ice on the river and lake was broken. The oscil- lations from the 8th to the 22nd were accom-	Poggendorff's Annalen, 2 Reihe. B. xxxix. S. 115, B. xvi. (xcii). S. 153-157; Preuss. Staatszeitung, 1829, Nrs. 124, 135 u. 151; Ann. de Chim. et de Phys. t. xlii. p. 348; v. Humboldt, Asie Centrale, t. ii. p. 111-113, &c.

1.	2.	3.	4.	5.	6.
1. Mar. 19. 30 <sup>m</sup> A.M.	Maling in Dalecarlia, Sweden.	tions lasted three minutes. Other oscillations followed, up to the 22nd, occurring many times a day, and sometimes lasting two minutes. At Irkutsk there was first a tremulous motion of the walls, and then a sort of vibratory blow, as when a heavy door is slammed to, followed again by tremulous motion. In Nischney-Udinsk the shock was also very severe.		panied by an extraordinary subterranean noise. At Irkutsk a clattering noise was heard before the shock, which noise lasted eight or ten seconds, and seemed to recur according to a certain rule. The noise was heard very loudly in high buildings, but upon level ground and at a distance from houses it was not perceived at all, whence Dr. Erman concludes that it was an atmospheric not subterranean sound. The sky had been clouded for some weeks before the earthquake, a phenomenon very unusual at this season at Irkutsk, where it is usually clear and dark blue. It was said by an inhabitant of the place that the cloudy sky at this season was a common antecedent to earthquakes.	
21. 20 <sup>m</sup> A.M.	Kingston in Jamaica ...	Two shocks from E. to W., as violent as those of 1812.		Accompanied by loud noise in the air	Preuss. Staatszeitung, 1829, Nr. 117; Corresp. d. Würtemb. Landw. Vereins, 4 Hef. 1829, S. 235; Journ. des Débats, 4 Mai.
30 <sup>m</sup> P.M. 20 <sup>m</sup>	In the province of Murcia, Spain. Slightly perceived at Madrid, and at Beas de Segura in La Mancha. The valley of Segura seems to have been the centre of disturbance; there the shocks were most violent. M. Cassas, French consul at Allicant, supposed the	Shocks were felt on board vessels at sea off the coast, fourteen miles N.E. from Torreveja, at 6 <sup>h</sup> 47 <sup>m</sup> , 6 <sup>h</sup> 51 <sup>m</sup> , 7 <sup>h</sup> 3 <sup>m</sup> , and 7 <sup>h</sup> 5 <sup>m</sup> . The last was very severe, and lasted forty-eight seconds.	The damage done was enormous in very many towns and villages of Murcia, and in Guardamar, La Mata, and Torreveja in Valencia, some places were totally ruined, and the destruction of churches and houses, and loss of life, were terrible. The premonitory noise like thunder was heard at Torreveja for more than three-quarters of an hour. It generally resembled the explosion of a cannon, and sometimes increased gradually and then suddenly ceased. It was not heard there after the 21st of March until September following. At Doña Nueva		Preuss. Staatszeitung, 1829, Nr. 223; Cavier, Hist. des Sc. Nat. t. v. p. 63, &c.
		Preceded by a slight shock at noon. That at 6 <sup>h</sup> 39 <sup>m</sup> was the most violent of all those felt here this year, and was followed by more than a hundred others during the night. At Torreveja the motion was undulatory, and forty-			Mouiteur, 10 Juillet, 20 Août, 13 Nov.; Journ. des Débats, 9 et 12 Avril; Constitutionnel, 9 et 15 Avril, 21 Juin, 6, 11 et 30 Oct.; Ann. de Chim. et de Phys. t. xxxix. p. 411, t. xlii. p. 348, t. xlv. p. 396; Gazette de Bayonne, 1829, Nrs. 28, 35, 52, 54, 55, 56, 57, 58, 73, 74, 79, 114; Ann. des Sc. Nat. t. xvii. 1 série, p. 105; Preuss. Staatszeitung, 1829, Nrs. 102, 107, 109, 111, 119, 136, 225;

shock to be vertical, from beneath, in the district lying between Orihuela and the sea, thus making this the centre.	eight shocks were counted between 5 p.m. and 6 a.m. the next morning. They continued with the same frequency up to the 26th, and until the 16th of April thirty or forty shocks or accompanying noises were observed. At Madrid an oscillatory motion, apparently from E. to W. or S.E. to N.W., lasting some seconds. At Granada the motion was observed to be from E. to W., or vice versa. At Murcia and in the whole district shaken on the 21st, shocks of more or less severity recurred daily up to the 30th.	and Daja Vieja fissures opened in the earth, and small holes appeared, from some of which large quantities of dry sand, and from others of sand and water, were thrown out. In Estremadura the water of a lake suddenly disappeared. On the right bank of the Segura, it was remarked, the shocks were more numerous and lasted longer than on the left. The course of this river has changed, and now enters the sea at a different place from its former mouth. In Madrid the shock was sufficient to set chandeliers, &c. in motion.	De Cabrerizo, Los Terremotos de Orihuela, Valencia, 1829, 8vo, &c.
1829. Mar. 22. Ancona in the States of the Church.	Two severe shocks ...	Accompanied by noise like the firing of artillery. No damage done.	New Monthly Magazine, 1829, Nov. p. 487; Moniteur, 18 Avril.
— 23. Kingston in Jamaica.	Another shock. Two others during the night.		Curier, Hist. des Sc. Nat. t. v. p. 63; Constitutionnel, 1 Juin, 21 Juillet; Moniteur, 21 Juillet.
— 24. Ditto.	Another shock; slight.		Ditto.
— 27. Ditto.	Another of great severity.		Ditto.
— 4 <sup>h</sup> 30 <sup>m</sup> A.M.			
— 31. Port-au-Prince in St. Domingo.	Two severe shocks ...		Ditto; Ann. de Chim. et de Phys. t. xlii. p. 348.
— 4 <sup>h</sup> 30 <sup>m</sup> P.M.			
— April 1. Madrid.	A shock		Authorities quoted under March 21.
— 2 A.M.			



1.	2.	3.	4.	5.	6.
29. April 2. 30 <sup>m</sup> A.M.	Dieppe and the neighbourhood, depart. Seine-Inférieure.	Several severe shocks; the first lasted several seconds.		The first shock was accompanied by noise like thunder.	Ann. de Chim. et de Phys. t. xlii. p. 348.
— 6. A.M.	In Murcia, Spain	More vibrations, lasting twelve seconds, and followed, two hours later, by another slighter shock.		Accompanied by noise lasting ten seconds	Authorities quoted under March 21.
— 7. A.M.	Petropawlowsk in Siberia.	A shock			Preuss. Staatszeitung, 1829, Nr. 243.
— 10. P.M.	Pontferrada in Leon, Spain.	An earthquake		Preceded by a violent storm of rain and snow	Ditto, Nr. 129; authorities quoted under March 21.
— 13. P.M.	Island of Thassia and the opposite coast of Macedonia, Turkey, extending as far as Adrianople.	The first and principal shock was horizontal, and came from the N.W. It was succeeded by other slighter ones until the next day.	Felt on board the ship of the Russian admiral 'Ricord,' off the coast of Thassia.	A tower and several houses on the coast were thrown down. The village of Pravi, seven or eight miles inland, lost seventy houses, and the village of Xanthi with its inhabitants was nearly swallowed up by the earth. In Adrianople some minarets and houses fell. The shock was preceded by a gust of wind from the S.E. In the island of Thassia bottles and glasses were thrown off the table.	Casseler Allgem. Zeitung, 1829, Nr. 158. S. 816, quoting Courier de Smyrna, 26 Avril.
— About the middle of the month.	Near Mount St. Helie in Messenia, Greece.	A slight shock, lasting some seconds.			Communication of M. Aug. Brullé to M. Perrey.
— 16. A.M.	In Murcia, Spain; places shaken on the 21st of March.	A very severe vibratory shock.			Authorities for the 21st of March.
— 17.	Ditto; at Orihuela and some other places in same district.	More shocks			Ditto.
— 18. 5 <sup>m</sup> A.M.	Ditto. Felt at Villajosa (Valencia) and Cartagena.	Shocks almost as violent as those of March 21. They lasted fourteen minutes without interruption at Almoradi and Torrevecija.		Caused new misfortunes at Almoradi, Torrevecija, Salinas, and Guardamar.	Ditto.

1829, April. Night between 18 and 19.	Malung in Dalecarlia, Sweden.	A severe shock .....	Accompanied by a noise in the air. This ac- count probably refers only to the event of March 18, 19.	This ac- coun- tains. 5 Heft. 1829, S. 289.
— 21. (Six weeks after the shocks of March.)	In the mines of Zyr- nowsk and Riddersk, on the banks of the Maglenka and Oulba, in the southern part of the Altaï, Siberia.	Shocks which were very considerable at the bottom of the mines.	M. Gelher of Barneoul says that earthquakes are v. more frequent in this district than elsewhere in the government of Tomak, which he attri- butes to the proximity of the hot springs Rakmanowka, which rise thirty-seven leagues to the east of Riddersk. v. Humboldt says that Riddersk is the extreme western limit of the Altaï earthquake region.	Humboldt. Asia Centrale, t. ii. p. 111-113; Fragments Asia- tiques, t. i. p. 126, 136.
— 22. 9 <sup>h</sup> 30 <sup>m</sup> P.M.	Freyburg and Münster- thal (2½ miles S. by W. from Freyburg), in Baden.	A rather severe vibra- tory shock, lasting some seconds, and apparently in the direction S.W. to N.E.	Accompanied by noise like thunder. Both the noise and shock were perceived in the mines near Münsterthal. At Freyburg a severe storm from the N.W. with snow followed im- mediately after. On the 2nd of May a large mass of rock fell in the Falkenstein, in the district of Freyburg.	Preuss. Staatszeitung, 1829, Nr. 126.
— 24. 1 <sup>h</sup> and 1 <sup>h</sup> 20 <sup>m</sup> P.M.	Almoradi and the envi- rons, in Murcia, Spain.	Renewed severe shocks.	Heavy rain fell almost the whole month through- out in Spain, producing great inundations.	Authorities for 21 March.
— .. May	Jackson (County?), Ten- nessee, United States.	Rather severe vibra- tory shock, of long duration.	.....	Preuss. Staatszeitung, 1829, Nr. 181, Beil.
— May	Again in the province of Murcia, Spain.	No less than fifty-one shocks on this day.	.....	Authorities quoted above for March 31; Allgemeine Zeitung, 1829, Nr. 140. S. 557.
— 4.	In the mountains of Al- bano, near Rome.	Vertical shocks .....	.....	Corresp. d. Würtemb. Landw. Ve- reins. 6 Heft. 1829, S. 337.
— 5. After noon.	On the coast of Macedo- nia and Thrace. Felt from Salonichi to Con- stantinople, and at the same time even in Bu- charest. Most violent in the southern part of the district shaken.	Several violent shocks, which at Salonichi frequently recurred until the 10th. At Adrianople the mo- tion of the earth had continued al- most every day from the 13th of April to the 5th of May.	In Salonichi, houses, mosques, and part of the town walls were thrown down. The little town of Drama was totally destroyed, and many of the surrounding villages were much injured. The towns of Kawa and Seres also suffered much. A mountain about ten miles from Drama suddenly poured forth a kind of reddish water.	Preuss. Staatszeitung, 1829, Nr. 188, Beil.
— 15 <sup>th</sup> to 17.	Torreveja in Murcia, Spain.	Fifty-three more light shocks.	.....	Authorities for the 21st March.

1.	2.	3.	4.	5.	6.
May 19, 11 A.M. to 2 P.M. of the day.	City of Mexico	Six violent shocks in the time mentioned. They recurred at intervals for two or three days.			Moniteur, 5 Août.
— between 21 and 22.	Albano, Genzano, La Riccia, and especially Castel Gandolfo, in the States of the Church.	Some shocks, followed by others for several days, the whole number amounting to fourteen or sixteen.		Houses were violently shaken, and one thrown down.	Journ. des Débats, 13 et 23 Juin; Moniteur, 23 Juin; Féussac, Bull. des Sc. Nat. t. xxvi. p. 32; Preuss, Staatszeitung, 1829, Nr. 163; Ann. de Chim. et de Phys. t. xlii. p. 348, 349.
— 22, 45 <sup>m</sup> A.M.	Graz in Austria. Felt in many parts of the town, and several of the suburbs. Not all felt in the suburbs on the right bank of the Mur.	A rather violent shock, in the direction N.E. to S.E. (?). Also said to have been perpendicular, and to have lasted about a second.		Preceded by uninterrupted rain for eight days, which began again heavily immediately after the shock, but lasted only half an hour. The sky then cleared, and fine warm weather set in. In some places the shock seemed as if a heavy weight had been let fall on the roof. No damage done.	Preuss, Staatszeitung, 1829, Nr. 157.
— 23, 11 A.M.	Constantinople and Scutari.	Two shocks.		No damage was done in Constantinople, but on the Asiatic side buildings were injured. The castles of the Dardanelles also received some injury.	Casseler Zeitung, 1829, Nr. 184. S. 955.
— 29, 11 <sup>m</sup> (A.M.?)	Island of Jamaica	A very severe shock, followed frequently by others up to June 7.			Preuss, Staatszeitung, 1829, Nr. 203; Moniteur et Constitutionnel, 21 Juillet, &c.
— ...	In the town (County?) of Jackson, Tennessee, United States.	Rather violent earthquake.		This account and that of April probably refer to one and the same event. The month of May was marked by storm and rains in many parts of Europe.	Corresp. de Württemb.; Landw. Vereins, 8 Heft, 1829, S. 115.
June 1.	Albano in the States of the Church.	Several shocks on this and some preceding days, more severe than those of May. At 10 A.M. a slight shock from E. to W. was felt at Bonn (in all probability Rome).		Some damage done at Albano	Preuss, Staatszeitung, 1829, Nr. 170; Journ. des Débats, 13 et 23 Juin; Moniteur, 23 Juin; Féussac, Bull. des Sc. Nat. t. xxvi. p. 32.

1829, June 1 to 5.	Torreveja in Valencia, Spain.	Sixty-eight shocks in the period mentioned, of which thirteen were very severe.	On the 7th a violent storm of rain, producing inundations.	On the 7th a violent storm of rain, producing inundations.	Authorities for March 21.
Night between 2 and 3.	On the Schneekoppe, Riesengebirge.	Three shocks			
4.	Lunrøe in Norway	A feeble shock			
Night between 8 and 9.	In the mountains of Albano near Rome.	Shocks			On the 2nd the usually clear mineral waters of Warmbrunn in Silesia appeared blue and milky.
10 to 15.	Torreveja in Valencia, Spain.	Twenty-four more shocks, of which one was terrible and almost as severe as that of March 21.			Keilbau. Corresp. d. Würtemb. Landw. Vereins. 7 Heft. 1829, S. 53.
13.	Albano in the States of the Church.				Authorities for March 21.
In the middle of the month.	In Island of St. Thomas in the West Indies.	An earthquake			Moniteur et Journ. des Débats, 23 Juin; Férussac, Bull. des Sc. Nat. t. xxvi. p. 32.
17.	At Murcia in Spain	Six shocks			Corresp. d. Würtemb. Landw. Vereins. 8 Heft. 1829, S. 116.
In the evening.	Ditto	Two more shocks, followed by others the next day.			Authorities for 21st March.
At sunrise.	Almoradi in Murcia	A severe shock, followed by a slighter one at 6 A.M., and by another at 6.30 P.M.			Ditto.
7 <sup>h</sup> 10 <sup>m</sup> P.M.	Paris	Several vibratory shocks, on the authority of some people living in the Rue du Mont, Parmasse.			Journ. des Débats, 5 Juillet; Constitutionnel, 4 Juillet; Ann. de Chim. et Phys. t. xlii. p. 349.
26.	Casn in the departm. Calvados, and the neighbourhood.	A slight shock, lasting two seconds.			Ditto.

1.	2.	3.	4.	5.	6.
9. June 28. Orihuela and San-Pedro-del-Pinadar, in Murcia, Spain.		Violent earthquake. Although of diminished severity the shocks were still frequent at Orihuela.			Authorities quoted under 21 March.
- July 1. Debrezsin, Vamos, Pertis, Karczag, Nagy-Karoly in the county of Tabor, Szathmar, Er-lau, and several other places in Hungary, included in a district of about forty-five geographical miles from E. to W., by ten from N. to S.		Several shocks. At Debrezsin the first shock occurred about 2 <sup>h</sup> after midnight; at 12 <sup>h</sup> 4 <sup>m</sup> A.M. two more of greater severity; and in the evening at 8 <sup>h</sup> 28 <sup>m</sup> P.M., three violent horizontal shocks in the direction E. to W. At Nagy-Karoly the first shock was at 4 A.M., and at 8 <sup>h</sup> 40 <sup>m</sup> P.M. there were two more, vibratory, from N.E. to S.W. or S.W. to N.E.; each of these vibrations lasted two seconds, and the interval between them was about the same. The shocks recurred at these places on the 2nd and 7th July. In Debrezsin no shock had been felt since 1746.		At Debrezsin the day before had been sultry and rainy; heavy rain also fell in the forenoon of the 1st; and at the time of the shocks felt in the evening there were reddish clouds in the horizon, and an appearance of a light for two seconds like lightning was observed. These last shocks were accompanied by subterranean noise. At Nagy-Karoly the shocks at the same time (8 <sup>h</sup> 40 <sup>m</sup> P.M.) were accompanied by a noise compared to that of a waggon laden with empty casks. At this place loose articles were set in motion, the springs disturbed and muddled (perhaps produced only by the preceding heavy rain), and various animals, particularly cats and dogs, rendered very uneasy. The barometer was not affected. The storms, thunder and lightning, rain, and hail, of this month and the preceding were very remarkable in many parts of Europe. vid. v. Hoff.	Prenss. Staatszeitung, 1829, Nr. 200, Nr. 218, B, Nr. 235.
— 2. In the province of Murcia, Spain.		Repeated shocks .....			Authorities quoted for March 21.

Time of the month.	Place.	Phenomena.	Remarks.	Source.
Night between 3 and 4.	Zwolle in Ober-Yssel, Holland.	A slight shock.	Marselles.	The weather had been stormy before, but at the time of the shock it changed to a perfect calm.
15.	Vitry and in the department of l'Aube, France.	An earthquake.		v. Hoff mentions a severe hailstorm in this district, but does not speak of an earthquake.
24.	Almoradi and the neighbourhood; Murcia, Spain.	More shocks.		A violent storm of lightning, and hail of unusual size (some of the hailstones weighing 10 or 12 oz.), during intense heat.
Between 10 and 11 P.M.	In the district of Hungary.	Three more shocks.		No damage done.
27.	In the district of Hungary.	An earthquake.		Great damage done to buildings, especially at Nagy-Karoly, Endred, Dengeley, Zriny, and Portelek. No earthquake had been observed in this region for 100 years before.
About 1 P.M.	Neusohl in Hungary.	Two more shocks.		Accompanied by a noise like distant thunder. More strongly felt in the mountains than in the low country.
3 <sup>h</sup> 15 <sup>m</sup> P.M.	Lunrøe in Norway.	Undulatory shocks, lasting four seconds.		In Copenhagen preceded by a hollow sound like that of a carriage passing under a gate-way. Moveable articles and even the walls were caused to oscillate. No effect on the barometer. This was the first shock felt in Copenhagen since the date of the great earthquake of Lisbon.
Aug. 3.	Colmar, St. Dié, Strasbourg, Belfort, Pontroy, and several other places in Alsace. Most severe at the two last named places.	Several shocks, in the direction N. to S.		During calm weather in Wologda, accompanied by subterranean noise. The buildings oscillated, and the lamps were thrown off from a
4.	In Hungary again.	A rather severe shock.		
7.	Copenhagen, Gothenburg, Christianshavn, and Amager, in Denmark.	In Copenhagen it lasted several seconds, and came from the N.W.		
17. (or 18?) 3 <sup>h</sup> 30 <sup>m</sup> P.M.	Port Antonio in Jamaica.	Two slight shocks (another account says, a severe earthquake).		
6 <sup>h</sup> 55 <sup>m</sup> P.M.	Verkotoemak in the government of Wologda and Cheakoursak in	In Wologda, three vibratory shocks in fifteen minutes. In		
Night between 31 and Sept. 1.				

stitutionnel, 17 Juillet.

Preuss, Staatszeitung, 1829, Nr. 197.

Communication of M. Aug. Bravais to M. Perrey. Authorities for 21st March.

Corresp. d. Würtemb. Landw. Vereins. 8 Heft. 1829, S. 134.

Preuss, Staatszeitung, 1829, Nr. 235.

Keilhau.

Corresp. d. Würtemb. Landw. Vereins. 8 Heft. 1829, S. 237.

Le Globe, 9 Sept.; Férussac, Bull. des Sc. Nat. Oct.; Ann. de Chim. et de Phys. t. xlii. p. 349; Corresp. d. Würtemb. Landw. Vereins. 8 Heft. 1829, S. 237.

Preuss, Staatszeitung, 1829, Nr. 238 u. 249; Moniteur, 3 Sept.; Ann. de Chim. et de Phys. t. xlii. p. 349; Keilhau.

Preuss, Staatszeitung, 1829, Nr. 315; Ann. de Chim. et de Phys. t. xlii. p. 348; Cuvier, Hist. des Sc. Nat. t. v. p. 63.

Preuss, Staatszeitung, 1829, Nr. 353; v. Humboldt, Asie Centrale, t. ii. p. 119; Moniteur, 31 Déc.

1.	2.	3.	4.	5.	6.
1829. Aug. Night between 31 and Sept. 1. 2 <sup>h</sup> 30 <sup>m</sup> P.M.	that of Archangel, Russia. New South Wales .....	Archangel there were but two shocks. A violent earthquake.		freely suspended chandelier. In Archangel, no noise and no damage done. The storms of July still continued in many parts of Europe. During a dreadful tempest. The earth was raised up in waves like the sea, forming in many places terrible fissures.	Asiatic Journal.  Ditto, N. S. vol. vii.
11 <sup>h</sup> 45 <sup>m</sup> A.M. 3 <sup>h</sup> 25 <sup>m</sup> P.M.	4. In the island of Erro- manga, one of the New Hebrides. Island of Martinique ... 5. Cremona in Italy .....	Ditto Rather a severe earth- quake in the direc- tion S. to N., con- sisting of several oscillations of about four seconds' dura- tion. At 8 <sup>h</sup> 15 <sup>m</sup> P.M. the oscillations recurred, and lasted three seconds. A shock, from S.W. to N.E.		Accompanied by subterranean noises, as were the shocks at 8 <sup>h</sup> 15 <sup>m</sup> . Cracks opened in several places in the vault of the church of St. Do- minica, several other buildings were injured, and bells were made to toll. The sky was cloudy, and the wind from the N.; soon after the sky cleared and the sun shone forth.	Moniteur, 8 Nov.; Constitutionnel, 16 Déc. Preuss. Staatszeitung, 1829, Nr. 263.
9. Frankfort on the Maine. 10 <sup>h</sup> 30 <sup>m</sup> A.M.				V. Hoff doubts this account, as a kind of whirl- wind passed over the city at the same time, to which he ascribes the report of an earth- quake.	Ditto, Nr. 259, Bell; Allgemeine Zeitung, Nr. 258, Bell. S. 1031; Constitutionnel, 17 Sept.  Authorities under March 21.
10. In the neighbourhood of Granada, Spain. 14. Island of Martinique ... 9 <sup>h</sup> 45 <sup>m</sup> P.M.		Three shocks .....	On the 26th and 27th of October a violent "raz de marée" on the coast of Mar- tinique.		Moniteur, 8 Nov.; Constitutionnel, 16 Déc.  Authorities for March 21.
19. Torrevieja in Valencia, Spain. 24. Murcia, Orihuela, and the neighbourhood. A.M. Oct. Ec-Anbonne in the Canton of du Vaud, Switzerland.		At least fifty shocks in this period. An earthquake which recurred during the following night. Several shocks .....		Storms and heavy rains continued to prevail in many parts of Europe during this month. Vid. v. Hoff. A brilliant meteor was also observed here which disappeared with a loud explosion. Followed	Corresp. d. Würtemb. Landw. Ver- ein. 12 Heft. 1829, S. 324.

gives the date Oct. 10, 10 <sup>a</sup> 1829 Oct. 5. 30 <sup>a</sup> P.M.) 10 <sup>a</sup> 5 <sup>a</sup> A.M.	In the district of Müritz- auschlag, circle of Bruck, Styria. Ex- tended as far as the Austrian territories.	An earthquake, whose direction was N.E. to S.W.	Threw down a piece of wall	Preuss. Staatszeitung, 1829, Nr. 297, Beil.
— 9. — — 12. — 11 P.M.	1. Lunrøe in Norway ..... 2. Gesenay, Saanen, in A the canton of Berne, Switzerland.	Two shocks ..... A rather severe shock.	Accompanied by subterranean noise, which seemed to come from different quarters. The beds trembled. The same day a great cleft opened in a mountain in the valley of Six. On the 15th also the earth sank, and clefts appear- ed on Mount Blonay in the Canton du Vaud.	Keilhan. Journ. des Débats, 1 Nov.; Ann. de Chim. et de Phys. t. xlii. p. 349; Preuss. Staatszeitung, 1829, Nr. 308.
— 13. — — 19. — (According to some, the 20th.)	Murcia, Orihuela, &c., in Spain. Granada in Spain .....	More shocks ..... At 1 A.M. a slight movement, scarcely perceptible; at 4 <sup>a</sup> 13 <sup>a</sup> another shock, stronger, but lasting only half a second. At 3 <sup>a</sup> 45 <sup>a</sup> P.M. a third shock, of equal force and duration.	Accompanied by subterranean noise. No damage done.	Authorities for March 21.
— 24. — 4 A.M.	Ditto .....	Another shock, the last recorded of the long series of dis- turbances: this year in Spain.	Besides the violent storms of wind and rain of Ditto. this year several other unusual phenomena had been observed in Spain, as luminous me- teors, halos round the sun and moon, extra- ordinary and unseasonable alternations of heat and cold, &c.	
— 26. — (The date Sept. 26 is also given.)	Valparaiso and Santiago. in Chili.	A shock nearly as vio- lent as that of 19 Nov. 1822, but of much shorter dura- tion, lasting but twenty seconds.	In Valparaiso a great many houses were more or less ruined, and in Santiago, where the earth- quake was more violent, many persons lost their lives. The village of Casa Blanca, thirty miles from Santiago, was completely ruined. The destruction of buildings was however not so great as in 1822.	Preuss. Staatszeitung, 1830, Nr. 49, Beil. S. 351; Froriep's Notizen, B. xxvii. Nr. 12. S. 186; Ann. de Chim. et de Phys. t. xiv. p. 398; Leonhard und Bronn. N. Jahrb. 1834. S. 459.





within half a minute at least).

in the S.W. part of the region shaken.

tween 7 and 8 p.m. another, very slight, vibration was felt. At Kischenew in Bessarabia the motion lasted three minutes. At Kiew, four minutes. At Chorol the vibrations were slight, but lasted ten minutes. At Jekaterinoslaw the duration of the motion was some seconds only. At Remi and Ismail the shock recurred at 8 p.m. At Otšchakoff a shock was felt at 3 a.m., but nothing at 4. At Iwanowka the shock was very severe. At Odessa Haüy was awakened by slight oscillations, which lasted about two-thirds of a minute, and were followed by a pretty severe shock of some seconds' duration. After renewed oscillations for about a minute, there came a second, very severe, shock, which lasted longer than the former. The oscillations then again decreased and

the motion was more strongly felt in the higher parts of the town than in the lower, and, in a stone building situated on an eminence, the south side only was injured, while the north suffered not at all. At Nikolajew accompanied by subterranean noise, like boiling. At Odessa the barometer was carefully observed during the earthquake, but did not show the least change. The magnetic needle could not be observed.

1.	2.	3.	4.	5.	6.
1829, Nov. 27. La Rochelle and Rochefort, in the departm. 4 <sup>h</sup> 5 <sup>m</sup> P.M.		<p>increased for twelve or fifteen seconds, a third shock, shorter and weaker than the first, occurred, then again the oscillations, and then the last shock, equal to the third, and lasting three or four seconds. Then a decreasing tremulous motion for about 1½ minute, and at 4<sup>h</sup> 2' 20" all was still again. Haily counted 152 vibrations in thirty seconds. The direction was found by a water bottle in which the water, raised by the shock, had washed off some of the dew on opposite sides of the glass. The line joining the two highest points of the curves thus produced on the dew glass lay 2° west of the astronomical meridian.</p>	<p>The crews of three ships reported that</p>	<p>Preceded by two loud explosions; the first was of but moderate intensity, but the second was</p>	<p>Ann. de Chim. et de Phys. t. xlii. p. 350; Férussac, Bull. des Sc.</p>

1829. Nov. 27.	Mondavio and Todini in the States of the Church.	blow was felt.	imagined their vessels had touched the bottom.	This and the explosions lasted at most four or five seconds. The explosions seemed to take place high in the air towards the south, and were quite unlike thunder, but were supposed by many to have arisen from the explosion of a powder magazine. The vibratory motion made the windows rattle, and moved some few articles which did not stand firmly. Several animals exhibited unusual restlessness a moment before the noise was heard. The barometer had been very low, and remained quite steady at the time of this phenomenon, but soon after began to rise.	Preuss. Staatszeitung, 1829, Nr. 353, Beil. Ditto. Ditto, Nr. 346. Ditto.
— 29 —	Ditto				
— 30 —	Innsbruck in the Tyrol.	A slight, almost vertical shock.		The day was calm and foggy. The barometer was not affected by the earthquake.	
8 P.M.	Dec. 1.	Ditto			
2 A.M.	—				
5 A.M.	6. La Rochelle and the environs for three or four leagues round. Also in Medoc, and other districts of the departm. Gironde.	A rather severe shock.			Ann. de Chim. et de Phys. t. xlii. p. 350; Férussac, Bull. des Sc. Nat. Avril 1830.
— 9 —	Santa Fé-di-Bogota in Columbia, S. America.	A slight vibratory shock, lasting four or five seconds.			Ann. de Chim. et de Phys. t. xlv. p. 402.
4 <sup>h</sup> 30 <sup>m</sup> A.M.	Also felt at Santa Anna, Honda, Cartago, and la Vega de Tupia; thus over a space of 6° of longitude, between the eastern and central chain of the Andes.				
— 10 —	In the circle of Neustadt, Illyria.	Another shock, the most violent of the three felt since November 2. Lasted four seconds.			Corresp. d. Würtemb. Landw. Ver. eins. 12 Heft. 1829, S. 325.

1.	2.	3.	4.	5.	6.
Dec. 22.	Belley in the departm. de l'Ain, France.	A shock of considerable severity and long duration.			Ann. de Chim. et de Phys. t. xlii. p. 351.
— A days be- he 28th.	Country around Vesu- vius.	Some tremblings of the ground.		Accompanied by subterranean noise like boiling. The volcano began to throw forth flame and stones, but no lava appeared.	Moniteur, 1830, Nr. 20. p. 78, Nr. 21. p. 81.
— 29.	Belley in the departm. de l'Ain, France.	Another shock.			Communication of M. Aug. Bravais to M. Perrey; Modenzeitung, 1830, Nr. 6. S. 48.
— at given cards	Hermannstadt in Hun- gary.	A very violent shock, which lasted a minute.		The weather was very cold up to the time of the shock, but became warm afterwards. For the various storms and other violent meteorological disturbances of this year vid. v. Hoff.	Ann. de Chim. et de Phys. t. xlii. p. 351.
Jan. 8.	Near Waldheim in Saxony, on both banks of the Tschopa.	A slight shock	On the 10th the sea rose suddenly to an unusual height on the west coast of Holland, and caused considerable injury to the dykes, &c. v. Hoff.	Accompanied by subterranean noise. On the 7th the water of the lake near Sabungen in the Duchy of Meiningen was strongly agitated, so that ice of 2 feet thick upon it was broken. v. Hoff.	Dorfzeitung, 1830, Nr. 23.
— 26. 10 <sup>m</sup> A.M.	Lucca	A slight vibratory shock, followed by another at about 5 <sup>a</sup> , and a third about 5 <sup>a</sup> 30 <sup>m</sup> . The last two were rather severe and lasted more than 5 secs.			Preuss. Staatszeitung, 1830, Nr. 45. S. 316; Ann. de Chim. et de Phys. t. xlv. p. 402; Férussac, Bull. des Sc. Nat. t. xxiv. p. 152.
—	Gutenstein in the circle of the Wiener Wald, Austria.	A violent vibratory shock.			Preuss. Staatszeitung, Nr. 61, Beil. S. 441.
—	Nauplia in the Pelopon- nesus.	An earthquake			Communication of M. Colla to M. Perrey.
Feb. 4. 9 <sup>m</sup> A.M.	Hiefau in the circle of Bruck, Styria. Felt throughout the whole district of Hiefau.	A vibratory shock, followed, in a quarter of an hour, by a violent oscillatory motion, and then a		Accompanied by a noise like that of the wind in a storm. The second shock was attended with a dull noise like thunder. The motion was so violent that people who were in bed thought they should be thrown out on the floor; the	Preuss. Staatszeitung, 1830, Nr. 61, Beil. S. 441.

1830, Feb. 8. 10 <sup>h</sup> 40 <sup>m</sup> A.M. (The Ann. de Chim. et de Phys. gives the date Feb. 7.)	Agram in Hungary .....	A shock of 2 secs. du- ration.	.....	windows rattled; wooden houses and bridges cracked; pictures and mirrors swung out from the walls, and loose plaster fell from the ceil- ings. The day was calm and clouded, but the day before had been clear. No damage to men or buildings ensued.	Ditto, No. 53, Beil. S. 381; Ann. de Chim. et de Phys. t. xlv. p. 402.
6 A.M.	Lauterbrunnen in the canton of Berne, Swit- zerland. Nauplia, Egina, and in Greece.	A shock in the direc- tion N. to S., last- ing 4 secs. Several shocks .....	.....	Felt equally in the upper and lower part of the town. In many of the houses cracks appeared in the walls, sheets of glass were broken, plates fell off the tables, and persons who were sitting distinctly felt themselves moved. On the 6th and 7th there had been a heavy fall of snow; the air then became warm and the bar- ometer stood very low. After the shock, about 11 <sup>h</sup> 38 <sup>m</sup> A.M., the sun suddenly shone out with great brilliancy for a few moments, and then the heavens became obscured by clouds as before, and a thick fog of a dis- agreeable smell prevailed for three hours. From the 12th of November, 1829, to the 7th of February, 1830, the cold was most intense in Central Europe, and great quantities of snow fell, which on its melting produced ex- tensive inundations.	Moniteur, 22 Mars.
Mar. 9. (According to others, 12.) N. S. 1 <sup>h</sup> 10 <sup>m</sup> P.M.; at Port Bour- noi, 1 <sup>h</sup> 30 <sup>m</sup> .	Kislar on the Terek (Caucasus), and still more violently in the village of Andrejew- kaja. Also felt at Tiflis, at Fort Bour- noi, and at Toki. Said also to have ex- tended to Moscow.	An earthquake, of 10 seconds' duration. At Andrejewskaja the direction of the shocks was N. to S., and they recurred for nine days. At Tiflis also the di- rection was N. to S., and the motion lasted 20 secs. At Fort Bournoi the	.....	In Andrejewskaja a church fell, and more than 400 of the inhabitants were buried beneath the mud roofs of their houses. A cleft was produced in a neighbouring mountain, and one half sank considerably. The shock was followed by a gust of wind lasting 10 minutes. A similar violent wind for 10 minutes was ob- served at Tiflis. At Fort Bournoi no damage was done, but at Toki 200 houses were ruined and many others injured.	Communication of M. Colla to M. Perrey. Ann. de Chim. et de Phys. t. xlv. p. 402; Das Ausland, 1830, Nr. 200. S. 800; Preuss. Staatszei- tung, Nr. 101. S. 752, Nr. 130. S. 978; Gaz. de Tiflis, Nr. 17 et 25; Constitutionnel, 25 Juin; v. Humboldt, Anat Centrale, t. ii. p. 119.

1.	2.	3.	4.	5.	6.
1830, Mar. 9, Astrachan 4 <sup>h</sup> (?) 30 <sup>m</sup> P.M.		motion was rather severe, and lasted about 2 minutes. Shocks lasting to- gether 30 seconds.		Great inundations were produced by the break- ing up of the ice on the rivers of the East of Europe at the end of this month.	Authorities quoted above (on the 9th).
— 21. Island of Martinique ... 2 <sup>h</sup> 30 <sup>m</sup> P.M.		A shock			Cuvier, Hist. des Sc. Nat. t. v. p. 96; Férussac, Bull. des Sc. Nat. t. xxii. p. 50; Colla, Giornale Astron. 1833, p. 71; Moniteur, 18 Juin; Eyrès, Nouv. Ann. des Voyages, Juillet, p. 125. Ditto.
— 29. Port-au-Prince in St. Do- mingo. 11 <sup>h</sup> 30 <sup>m</sup> P.M.		A violent shock, last- ing more than two seconds.			Ditto.
— 30. Ditto		Ditto			Ditto.
— 0 <sup>h</sup> 30 <sup>m</sup> A.M.		Ditto			Ditto.
— 1 A.M.					
— Apr. 1. At Guatemala		Some shocks			Authorities given under the 21st Apr.
— 4. Eglisau in the canton of Zürich.		A vibratory shock		On the 6th Vesuvius was in a state of activity ...	Preuss, Staatszeitung, Nr. 145, Beil. S. 1093.
— 12. Guatemala		Thirty-five more shocks, some severe, some slight.		Several villages, in particular Amatitlan, Finula, and Petassa, were ruined.	Authorities for the 21st April.
— 14. Island of St. Domingo...		Two other shocks.		Accompanied by noise like distant thunder when it loses itself in the echoes of mountain ra- vines. Houses of brick and stone suffered se- verely. It was remarked that in the Leeward Isles earthquake shocks were generally in the direction of the meridian, i. e. either from N. to S. or S. to N.	Authorities for March 21.
About 6 <sup>h</sup> 30 <sup>m</sup> P.M.		more violent than those of March 29, 30. Duration = 4 or 5 seconds. The first shock was from E. to W., and the se- cond from W. to E. A shock from E. to W.	The shocks were felt on board vessels both in port and on the open sea.		
— 20. Soleure and on the banks of the Aar, Switzerland.				During a tempest which extended over all Ger- many and continued up to the night of the 21st.	Preuss, Staatszeitung, Nr. 129, Beil. S. 973, Nr. 116, Beil. S. 874; Mörian; Studer.
— Fifteen wersts west of Baku in Georgia.		An earthquake			Preuss, Staatszeitung, Nr. 196, Beil. S. 1502.
— 21. Guatemala		Fifty-two shocks in			Ditto, Nr. 261, S. 2003; Das Analand,

4 A.M. to 22. 5 P.M.					1830, Nr. 315. S. 1256; Féussac, Bull. des Sc. Nat. t. xvi. p. 32; Colla, Giorn. Astron. 1833. p. 72.
1830. Apr. 23. 9 P.M.	Ditto				Several houses were much injured. A village, 6 leagues from the city, was entirely destroyed.
— 27.	Ditto				More houses injured. Ditto.
— May 9.	Teheran in Persia				The city suffered much
— 11.	Eglisan in the canton of Zurich.				Accompanied by very loud noise. The houses were caused to rock.
— 18.	Reggio in Calabria				Accompanied by subterranean noise. On the 16th a great eruption of Etna.
— June 8.	Kindberg and Münz- zuschlag in Styria.				Ditto, Nr. 145. S. 1093; Mérian; Studer.
— 10.	Werchne-Udinsk in the government of Irkutsk, Russia.				Moniteur, 21 et 24 Juin; Preuss, Staatszeitung, Nr. 165. S. 1252.
— 8 P.M.					Preuss, Staatszeitung, Nr. 195, Beil. S. 1491.
— 19.	Island of Martinique				Ditto, Nr. 258. S. 1974.
9 <sup>h</sup> 30 <sup>m</sup> P.M.					Authorities for March 21.
— 26.	Graz and Bruck in Sty- ria. Also felt at Leo- ben.				Preuss, Staatszeitung, Nr. 187. S. 1428.
5 <sup>h</sup> 57 <sup>m</sup> A.M.					Windows rattled, and plaster fell from the ceilings. The air was calm, but somewhat thick and foggy. The barometer exhibited no particular change.
— 26. and 27.	In China; in the pro- vince of Honan, and the parts of Pe-Tche- Li between 35° and 37° N. lat., to the south of Peking.				Preceded by terrible portents. Some days before the earthquake burning vapours filled the atmosphere, dull explosions were heard in the air, long bands of fire appeared on the horizon (thunder and lightning?), and when the first shock was felt a violent storm of rain and hail burst forth over the land. The con- sternation produced by the earthquake was so great, that no accurate accounts had been collected of the damage done, but it was known that 12 towns had been swallowed up or more
					Garnier, Météorologie, p. 167; Gothaische Zeitung, 1831, Nr. 140.



1.	2.	3.	4.	5.	6.
1830. June....	At the Cape of Good Hope.	An earthquake		or less injured. At the same time the district of Ching-Ting-Fou at the other extremity of Fe-Tsche-Li, was visited by a terrible tempest, with hail of enormous size, and productive of dreadful inundations. It was supposed at Canton that 6000 or 7000 perished altogether in these convulsions of nature.	Das Ausland, 1831, Nr. 115. S. 460.
— July 5 A.M.	Huszt in the county of Marmarosch, Hungary. The last shock was also felt at Sziget, and at the mines of Sugatagh and Slattina.	Three extremely severe shocks, followed at 9 P.M. by a very violent one. Direction of the shocks = S. to N.		Two large masses of rock were detached and rolled down from Table Mountain. The larger mass was estimated at 40 or 50 tons. The accompanying loud noise lasted 45 seconds, and produced much uneasiness in Cape Town.	By the last shock (at 9 P.M.) many houses were injured.
— 9.	In the island of Ægina.	A slight earthquake			Forley's Notizen, Nr. 544. S. 250.
— 13.	Messina and Catania in Sicily.	Severe shocks			Preuss, Staatszeitung, Nr. 236. S. 1808.
— Aug. 2. At Murcia in Spain.		An earthquake, the direction of which was the same as that of March 8, 1829, namely N.E. to S.W. Consisted of two rather violent shocks.		Accompanied by a dull noise, which lasted nearly a minute. No other attendant phenomenon of note was observed, except a visible moisture in the atmosphere (mist?).	Garnier, Météorologie, p. 96.
— 8. Kiachta in Siberia.					Colla, Giornale Astron. 1833, p. 74. Preuss, Staatszeitung, Nr. 275. S. 2107.
— 0 <sup>h</sup> 27 <sup>m</sup> A.M.					
— 11.	Clagenfurth and neighbourhood, Scuttschach, Forlac, and Loibl; in Carinthia.	An earthquake			Colla, Giornale Astron. 1833, p. 74.
— Sept. 1.	Erromanga Bay in the New Hebrides.	A slight vibratory shock, lasting about	Also felt at sea		Das Ausland, 1832, Nr. 202. S. 807.

Sept. 9. In the Swabian Alps, especially in a part of the bailiwick of Münstingen. Very perceptible in Hayningen, Zwiefalten, Münsingen, Buttenhausen, Ebingen, &c., throughout the Alps of Zwiefalten. Also felt at Scheer in the bailiwick of Wangen.	A vibratory shock, the direction of which, as well as of those of the following days, was S. to N., stretching probably somewhat to the E. Duration of the shock = 2 seconds.	Articles of furniture rattled together, easily shaken objects were moved, and the plaster fell off here and there from the ceilings. People who were in the house felt as if the whole building were shaken by a direct shock or by a violent thunder-stroke.	Schweigger u. Seidel, N. Jahrbuch d. Chemie, Th. v. S. 279.
— 10. Ditto	Another shock, of equal duration with the last.	Ditto.	
— 12. Ditto	Another shock, more violent than either of the two preceding, and lasting three seconds.	At Münsingen, Tübingen, and Stuttgart, the barometer fell about the time of the shock, but, as v. Hoff remarks, this fall was observed over a district of Europe too extensive to render it probable that it was in any way connected with the earthquake.	Ditto.
— 16. Manila in the island of Luçon, Philippine Isles.	Some shocks	During a typhoon	In M. Perrey's Memoir on Earthquakes in the basin of the Rhine, p. 90.
— 19. In Ober-Marchthal, at the southern foot of the Swabian Alps	A feeble shock		Schweigger u. Seidel, N. Jahrbuch d. Chemie, Th. v. S. 272.
— 23. Again in the Swabian Alps. Felt, at the same time, at Kalw, in the bailiwicks of Urach, Münsingen, and Balingen, at Onstmettingen, near Ober-Marchthal at the southern foot of the Alps, in the western part of the bailiwick of Saulgau, and in that of Marbach.	At Kalw three shocks quickly succeeding each other were felt. The direction seemed to be W. to E. In the bailiwick of Münsingen, in Hayningen, Buttenhausen, Apfelfelsten, Oberrödingen, and Huldretten, the same observations were made; the motion passed	Accompanied at Kalw by a rolling noise. Buildings and furniture were made to vibrate. The air was calm. At the other places mentioned in Column 3, houses were also shaken, doors opened, &c. At Buttenhausen the shock was particularly felt in the houses on the water's edge. On the morning of the 22nd the barometer reached its lowest point for the month. From then until the morning of the 23rd it rose rapidly, then fell slowly during the whole day. On the 22nd heavy rain fell all day, with southerly and westerly wind. At the time of the earthquake the rain had stopped, and the sky was clouded, but in the evening	Ditto.

1.	2.	3.	4.	5.	6.
Sept. 24. 10 <sup>m</sup> P.M.	Ditto, particularly at Onstmettingen in the bailiwick of Balingen.	from W. to E., and lasted six or eight seconds.		the rain began again.	Schweigger u. Seidler, N. Jahrbuch d. Chemie, Th. v. S. 272.
— 26. Lisbon		Another shock, the last felt in this region of the Alps. Two slight shocks, each of which lasted about fifteen seconds.			Preuss, Staatszeitung, Nr. 305. S. 2354.
— 29. Oporto.		A shock.			Colla, Giornale Astron. 1833, p. 74.
Oct. 3. In the island of Egina, Greece.		Two feeble shocks			Ditto.
Nov. 23. M.	In the Duchy of Baden, at Freiburg, Mühlheim, and Lörrach; and at St. Louis, Mühlhausen, Bâle, and Strasburg. Also felt at Berne.	Several shocks, apparently in the direction S.W. to N.E. At Bâle (6 <sup>h</sup> 4 <sup>m</sup> ) the shock was very violent.		Preceded by a noise which began with a dull heavy sound as if a great weight had been let fall, and ending with a rattle as of carriages over pavement. Bedsteads were set in motion, doors cracked, and glasses rang. In the places on the west of the Rhine an explosion like that of a cannon preceded the shock. In the mine "Neue Hoffnung Gottes" at St. Blaise in Baden, the shocks were very strongly felt at 5 <sup>h</sup> 45 <sup>m</sup> . For Strasburg some accounts give the date Nov. 24 instead of 23.	Dorfezeitung, Nr. 227, S. 910; Preuss, Staatszeitung, Nrs. 335, 339 u. 346; Mérian; Ann. de Chim. et de Phys. t. xlv. p. 402; Colla, Giorn. Astron. 1833; Studer.
— 1 of the 11th.	About Vesuvius	Subterranean disturbances on several days.		Accompanied by very little eruption.	Dorfezeitung, Nr. 227. S. 910.
Dec. 2. 5 <sup>m</sup> A.M.	In the mine "Neue Hoffnung Gottes" at St. Blaise in Baden.	Another strong vibratory shock.		The windows of the building attached to the mine rattled, and the whole building itself seemed to shake. The miners fled in alarm from the mine.	Preuss, Staatszeitung, Nr. 346. S. 2690; Mérian.
— 3. 11 8 A.M.	Innsbruck in the Tyrol.	A shock from N.W. to S.E. Lasted six seconds, with constant intensity.		Accompanied by a rattling noise like the breaking of glass. Articles of furniture and glasses were set in motion. The sky was clear, but the lower part of the atmosphere cloudy. Wind S.E., slight.	Preuss, Staatszeitung, Nr. 347. S. 2697; Colla, Giorn. Astron. 1833, p. 75.
— 8.	Near Rehhausen and Genstätt (near Naumburg).	Vibratory shocks.			Dorfezeitung, 1831, Nr. 3. S. 11.

1830. Dec. 28. Coblenz and Neuwied, and the surrounding country. About 2 P.M.	A shock from N. (N.W.?) to S.E. At Ribenach, six or eight seconds after the explosion there heard, a quick strong shock.	At Ribenach, at the time mentioned, there arose a violent storm, which, however, only lasted a few minutes, and was followed by a loud explosion as of a piece of heavy ordnance. Two days before, the wells at Bubenheim (1½ mile from Coblenz, and ½ mile from Ribenach) suddenly dried up. On the 26th, at 2 A.M., the river Douro in Portugal, between Roa and Aranda, suddenly lost all its water, which did not return until 10 A.M. A short time before or after this event, quite the same thing happened to the river Alba de Tormes.	Preuss. Staatszeitung, 1831, Nr. 6, Beil. S. 48, Nr. 41. S. 344; Gotha'sche Zeitung, 1831, Nr. 5.
— 29. Sulmona and some other places in the Abruzzo, Italy.	Violent shocks		Preuss. Staatszeitung, 1831, Nr. 26, Beil. S. 219.
— In the island of Amoy, one of the Moluccas.	A violent earthquake.		Berghaus' Almanach für Fremde der Erdkunde, 1837, S. 224.
1831. Jan. 2. Lago-Negro in the Basilicata, kingdom of Naples.	An earthquake of 20 seconds' duration.	Ten houses and a neighbouring church fell	Preuss. Staatszeitung, 1831, Nr. 26, S. 219, Nr. 43, Beil. S. 359.
— (At the same hour?)	A severe shock	Buildings were injured, and masses of rock detached.	Ditto.
— 15. In the government of Nertschinsk in Siberia.	A slight earthquake, lasting about ten seconds. The shock was directed towards the N.E., and was more violent on the N.E. than any other side.	Accompanied by noise like thunder	Ditto, Nr. 112. S. 839.
— 18. Messina	Several shocks		Garnier, Météor. p. 96; Colla.
— 28. Ditto. Also on this day at Palermo.	Ditto. At Palermo one shock.		Ditto; Pogendorff's Annalen, B. xxiv. S. 54.
Between 10 of Remiremont and 11 P.M. St. D'6, department Vosges.	A severe shock from S.W. to N.E.	At Gérardmer the shock was accompanied by a dull but distinct noise.	Moniteur, 15 Fév.
Feb. 9. Palermo	Another shock		Garnier, Météor. p. 96; Colla; Pogendorff's Annalen, B. xxiv. S. 54.

1.	2.	3.	4.	5.	6.
1831, Feb. 10.	Messina. The centre of disturbance seemed to be at Melazzo (twenty miles to the N.).	More shocks. At Melazzo more than sixty were reckoned.		From the 19th to the 25th the upper crater of Etna was in eruption, after which these shocks diminished in number, but did not cease until after the eruption in the island of Pantellaria in the month of July.	Garnier, <i>Météor.</i> p. 96; <i>Pogg. Ann.</i> B. xxiv. S. 54; <i>Preuss. Staatszeitung</i> , Nr. 163. S. 1052.
— 22. Mar. 1. 11 P.M.	Aleppo. .... Ardvoirlich, Killin, and Tyndrum, in Perthshire, Scotland.	A violent earthquake. A shock which came from the N.W.		Accompanied by a sound resembling a sudden gust of wind. Doors and windows were shaken. The night was calm and frosty. The barometer was low; at Inverness the mean height for February was 29.10, the lowest monthly average for the year.	<i>Dorfzeitung</i> , 1831, Nr. 65. D. Milne's Catalogue of British Earthquakes, <i>loc. cit.</i>
— 8 P.M.	Dover, Ramsgate, Margate, and Deal, on S.E. coast of England.	A severe shock			<i>Preuss. Staatszeitung</i> , Nr. 73, Beil. S. 610; <i>Journ. des Débats</i> , 7 Mars; <i>Férussac</i> , <i>Bull. des Sc. Phys. et Math.</i> Août 1831.
— 17.	In the island of Bardsey off the S.W. coast of Caernarvonshire.	A shock of an earthquake.		The shock was felt in the lighthouse on the island, and "set the whole building in quick vibration, and filled every one on the island with indescribable alarm." A similar shock had been felt in Bardsey about seventy years before.	J. H. Brunsby in the <i>Christian Reformer</i> , vol. xviii. p. 504.
— 26. 11 <sup>h</sup> 25 <sup>m</sup> A.M.	San Remo in Pignerol (Piedmont).	Severe vertical shocks, and more prolonged oscillations, together lasting fourteen seconds.		Preceded by subterranean noise like the rattling of carriages. A thick mist (cloud of dust?) rose above the roofs of the shaken buildings.	Alb. Nola, <i>del Tremuoto Avvenuto nella città e provincia di S. Remo l'anno 1831</i> . Pignerolo, 8vo. 46 p.
— 28.	Taggia and Castellaro in Pignerol (Piedmont).	A severe vibratory shock.		Fifty-two houses were thrown down, many others injured, and a bridge cracked. On the plain, and on the western side of the hill fissures opened in the earth.	Ditto.
— April 2.	In Sicily Cariati in Calabria Citra	Shocks. .... A shock, followed by several others.		The town of Melazzo was ruined	Huot, <i>Géologie</i> , p. 117. <i>Gothaische Zeitung</i> , 1831, Nr. 86.
— Before the 3rd (when the account was written).	In the southern part of the island of Samos.	Violent shocks, ....		Followed by the fall of one of the highest mountains opposite Icaria. An enormous mass of water burst forth from the mountain and carried everything before it on its way to the sea. The Constitutionnel of 6 Juillet gives the date	<i>Preuss. Staatszeitung</i> , Nr. 160. S. 1040.

1831. April 12. Noon.	At sea, in 0° 22' S. lat., and 23° 27' W. long.	.....	On board the ship. 'l'Aigle,' Capt. J. Taylor, a shock was felt exactly as if the vessel had touched upon a rock.	..... The rudder was greatly agitated, and a dull sound was heard beneath the water. The weather was fine, and the sea calm.	..... Daussey in the Comptes Rendus de l'Acad. t. vi. p. 514.
.....	Cariati in Calabria Citra	.....	.....	.....	..... Gothaische Zeitung, Nr. 86.
.....	Orleans in France and the neighbourhood.	.....	.....	.....	..... Journ. des Débats, 3 Mai.
.....	Genoa, and Porto-Mauricio on the Genoese coast (about twenty-seven miles from Monte Negro). Also felt at Marseilles.	.....	.....	.....	..... Gothaische Zeitung, Nr. 101; Journ. des Débats, 8 Juin; Ferrussac, Bull. des Sc. Nat. t. xxvi. p. 152.
.....	Ditto. Not reported as having been felt at Marseilles. Particularly severe at Vintimiglia and Albenga.	.....	.....	.....	..... Ditto.
.....	Odessa	.....	.....	.....	..... Constitutionnel, 8 Sept.
.....	In Sicily, especially at Sciacca. Also felt at Palermo.	.....	.....	.....	..... Moniteur, 1 Sept., 2 et 28 Oct., 10 Nov.; Garnier, Météor. p. 95; v. Hoff.



30 <sup>m</sup> P.M.	far as Venice.	different places.	Colla.
1831. Sept. 30. Palermo .....		At Parma violent shocks from N.E. to S.W., which lasted more than eight seconds (minutes according to another account). At Venice they lasted the same time, but the direction was E. to W. Followed by other shocks on the 12th and 13th. A shock .....	chimnies fell, bells sounded of themselves, clocks were stopped, and the horses and dogs showed great alarm. At Reggio 200 chimnies were thrown down, and the Benizzi palace was in great part ruined. From the 10th the water in the wells of Parma had been troubled.
Oct. 8. 8 <sup>th</sup> 30 <sup>m</sup> P.M.	Arica in Peru. Extended towards the south to the most distant extremity of the republic, and towards the north as far as Camana, (therefore over about 7° of lat.). Felt at Chuquisaca, 400 miles inland.	A violent vibratory shock, in a vertical direction, which lasted about seventy seconds. The motion proceeded from S. to N. This principal shock was followed at 11 P.M., and 5 A.M. the next morning, by others, and even as long after as February 7, 1832, a distinct trembling of the earth was felt. In the intermediate time ninety-seven shocks were reckoned.	On the 21st an eruption of Vesuvius had begun, which continued until the end of the month, and began again on the 6th or 7th of October, lasted until the 15th of that month, and then gradually ceased. Preceded by a subterranean hollow rolling noise like distant thunder, but louder. It lasted about ten seconds. Many houses were thrown down, and others injured, the walls cracked, &c. The shocks of later date were unaccompanied by noise. (According to another account scarcely a stone was left upon another in Arica, and a village fifteen leagues to the south was also totally destroyed, but one lying to the north of Arica, although nearer, suffered less.) No earthquake of any consequence had been felt in this region for nearly a century.
16. In the Romagna, Italy....		Also felt at sea at the distance of a hundred miles from Arica. The ships in harbour experienced violent shocks.	Poggendorff's Annalen, B. xxiv. S. 54; v. Hoff. Edinburgh New Phil. Journal. April and July 1834; Das Amiland, 1831. Nr. 110. S. 440. Antologia di Firenze, 1832, Jan. p. 213.



1.	2.	3.	4.	5.	6.
1831, Oct. 27 to Nov. 7.	Foligno in the States of the Church.	Daily shocks during this period. The most violent were on the 7th of No- vember.		Many houses thrown down	Journ. des Débats, 2 Déc.; Garnier, Météorologie, p. 109.
Nov. 17. 6 <sup>h</sup> 15 <sup>m</sup> A.M.	Swärdsjö near Fahlun in Sweden.	A shock from S. to N.		During a violent storm from the north. The shock was accompanied by a loud explosive noise, which was heard also in the villages of Mornäs and Zenger, and at Fahlun. An ex- traordinary light appeared in the northern horizon.	Preuss. Staatszeitung, Nr. 331. S. 1825.
19. In the evening.	Neufchâtel and Fribourg			Perhaps this account only refers to the events of the 20th and 22nd, wrongly reported as to date.	M. Studer's Catalogue.
20. 10 P.M.	Val-de-Travers, Locles, and Neufchâtel	Two slight shocks			Journ. des Débats, 1 Déc.; Consti- tutionnel, 19 Déc.
22. 9 <sup>h</sup> 55 <sup>m</sup> P.M.	Fribourg in Switzerland				Mérian.
29. 9 <sup>h</sup> 30 <sup>m</sup> P.M.	In and about the Thü- ringerwald, in the di- strict of the sources of the Werra and Schleusse. Most strongly felt in the higher mountain re- gions of the Thürin- gerwald, at Trauen- wald, Schmiedefeld, and Neustadt; to the north in the bailiwick of Gehren and Katz- hütte; and on the south along the course of the Werra to Eisfeld and Hilburghausen.	A severe vibratory shock, strong enough to make the houses quiver. Three sepa- rate vibrations are said to have been felt, of which the se- cond only was at- tended with noise.		Accompanied by a very loud rolling noise passing from S. to N., and lasting five or six seconds. On the day of the earthquake, before and after the shocks, and on the day before, a calm pre- vailed, but the preceding days had been stormy. The Werra was unusually high. According to some accounts, a fireball, apparently as large as the moon, was seen passing towards the west.	Dorfzeitung, Nr. 224. S. 905, Nr. 227. S. 917, Nr. 229. S. 927.
30.	Neufchâtel In Chili	Shocks			Ditto, Nr. 231, S. 934. Perrey's Memoir on Earthquakes

1831. Nov. ...	Fornovo, fourteen miles from Parma.	Slight shocks during a period of several days.	.....	.....	Colla.
— Dec. 3. 7 <sup>h</sup> 50 <sup>m</sup> P.M.	In the island of Trinidad. Also felt in St. Christopher's.	A violent earthquake. In Trinidad the first shock lasted nearly three seconds, and was followed by an oscillation perceptible for four to six seconds. After the noise which succeeded this, the second shock occurred, which was much more terrible than the first. At 10 P.M., and at 2 A.M. the next morning, shocks were also felt, but of nothing like the violence of the first.	The sea was in a state of violent agitation, and on board ship the shocks were felt as well as on land.	Followed by a noise like distant thunder. When the second shock occurred the earth seemed to rise and fall like the waves of the sea, and the strongest as well as the slightest buildings quivered to the ground. In the early part of the evening the heat was unbearable, and during the earthquake there was not a breath of wind stirring. Some heavy showers of rain followed.	Ausland, 1832, Nr. 110. S. 440, quoting a journal of Trinidad of the 7th Dec. 1831; Monthly Magazine, 1832, April, p. 169; Leonhard u. Bronn, N. Jahrbuch für Mineralogie, 1833, S. 127.
— 4. 9 <sup>h</sup> 30 <sup>m</sup> (Italian time).	In Piedmont, at Caggia (Taggia?) and Castellaro and in the neighbourhood, where shocks were felt on the 28th of March. The valley separating these two places seemed to be the centre of disturbance.	More shocks	.....	.....	Alb. Nota del Tremuoto Avvenuto nella città e provincia di S. Remo, l'anno 1831.
— 22.	Mount Veauvius	Violent tremblings	.....	Accompanied by loud detonations	Allgemeine Zeitung, 1832, Nr. 17, Beil. S. 65, Nr. 33, Beil. S. 132.
— 24. Evening.	Ditto	Another, very violent	.....	Five fissures opened, from which the lava flowed on the morning of the 25th, and continued to flow until January 9, 1832.	Ditto.

1.	2.	3.	4.	5.	6.
1831, Dec. 25. 9 P.M.	Lohaghat in Kemaon, in the N.E. of Hindostan; on the southern slope of the western spur of the Himalaya.	An undulatory motion of the earth from N.W. to S.E., lasting seven seconds.			Berliner Spensersche Zeitung, 1837, Nr. 59.
1832, Jan. 1. In one of the earliest hours of the morning.	Resina at the foot of Vesuvius.	An earthquake			Allgemeine Zeitung, Nr. 33, Beil. S. 132.
— 13. After 2 P.M. at Foligno.	Foligno, Bevagna, Perugia, Assisi, Spello, Montefalco, Canara, and in Rome. Most violent at the two first named places. Extended along a line parallel to the Apennines. Felt at Parma.	At Foligno a terrible shock, followed an hour after by a second. At Bevagna the first shock lasted eleven seconds, and was followed by five others. At Rome the shocks were undulatory, and not severe. They recurred at 3 P.M., and at 2 A.M. the following morning. At Foligno the shocks continued at intervals up to the 15th. During the night of 13 to 14, there were 38. Another vibratory shock.		Preceded and followed at Foligno by violent rain mixed with hail. A man going to draw water found the well filled to the brim, and the furrows in the fields full of muddy water (from the rain?). A few minutes after, he felt the first shock. On returning soon after to the well, he found it quite dry; the water also had disappeared from the fields, in which deep cracks were to be seen. Near Bevagna much resinous and sulphurous matter was said to have come out of the earth. Here and at several other places buildings were injured.	Allgemeine Zeitung, Nr. 24, S. 94, Nr. 26, S. 102, Nr. 42, S. 165; Ausland, Nr. 81, S. 324, Nr. 110, S. 440; Journ. des Débats, 31 Janv.; Constitutionnel, 30 et 31 Janv.; Colla.
— Night between 17 & 18.	Rome	Another vibratory shock.			Allgemeine Zeitung, Nr. 33, Beil. S. 131.
— 27.	Foligno	Another slight shock			Constitutionnel, 25 Fév.
— 29.	Trevi, six miles from Foligno.	A shock			Ausland, Nr. 110, S. 440.
— Feb. 1. About noon and 10 P.M.	In the Haute Engadine, Switzerland.	Shocks at the hours mentioned.			Mélan.

1832. Feb. 16. Sciaccia in Sicily ..... 4 A.M.	A slight shock.....	At the same time vapour was seen to rise from the sea in the same place where the new island had made its appearance in the preceding July. On this day Vesuvius, which had remained quiet since the beginning of the year, began to send forth smoke, and on the 20th an eruption of stones, lava, &c. commenced, which continued more or less (with slight tremblings) up to the end of March, and slightly till the end of July, when a great eruption occurred.	At the same time vapour was seen to rise from the sea in the same place where the new island had made its appearance in the preceding July. On this day Vesuvius, which had remained quiet since the beginning of the year, began to send forth smoke, and on the 20th an eruption of stones, lava, &c. commenced, which continued more or less (with slight tremblings) up to the end of March, and slightly till the end of July, when a great eruption occurred.	At the same time vapour was seen to rise from the sea in the same place where the new island had made its appearance in the preceding July. On this day Vesuvius, which had remained quiet since the beginning of the year, began to send forth smoke, and on the 20th an eruption of stones, lava, &c. commenced, which continued more or less (with slight tremblings) up to the end of March, and slightly till the end of July, when a great eruption occurred.
— 21. Pozzuoli near Vesuvius.....	Slight shocks .....			Ditto; Audot, Roy. de Naples, p. 74.
— In Umbria .....	Constant oscillations during the whole month.....			Allgemeine Zeitung, Nr. 52, Beil. S. 297.
— Lahore, the valley of Badkshan, and other parts of North-western India.....				Trans. Geol. Soc. (London) 2nd series, vol. iii. pp. 492. 494.
— March 8. In Calabria Ulteriore and a small part of Calabria Citeriore. Principally on the east of the Apennines, at S. Severino, Cotrone, Isola, Cutro, Policastro, Catanzaro, Roccabernardo, Roccafineto, Scandale, S. Mauro, Castello, and Ciro; also slightly in some places to the west of the mountains, especially at Monteleone and Reggio. In Calabria Citeriore the earthquake was felt at Cosenza. At Naples two or three slight shocks were felt.	A violent and destructive earthquake. The first, vibratory, shock was the most violent, in the direction S.E. to N.W., and lasted 11 seconds. The shocks recurred not only during the following night, but more slightly up to the 16th.			Algemeine Zeitung, Nr. 86, Beil. S. 343, Nr. 87, S. 347, Nr. 99, Beil. S. 393, Nr. 100, Beil. S. 397; Audot, Roy. de Naples, p. 74; Constitutionnel, 24 Mars, 18 Avril.

1.	2.	3.	4.	5.	6.
1832, Mar. 11, 12, 13, 14, and 15.	Assise, La Bastia, La Cannara, Catanzaro, Cotrone, Monte- Leone, Reggio, Milan, Mantua, Verona, Reg- gio (in Modena), Ge- noa, and Parma.	Violent and repeated shocks. At Milan, Mantua, Verona, Reggio, and Genoa, they were felt from the 11th to the 13th, and at Parma daily from the 11th to the 17th. At the latter place they were in the direc- tion of the magne- tic meridian. At Giornico, Bellin- zone, and Lugano, on the 13th, after 3 P.M.	.....	La Bastia and La Cannara were completely ruined, and at many other places great damage was done. At the time of the shocks of the 14th and 15th the waters of the lake of Desima in Russia were extraordinarily disturbed, and a noise was heard like that of a storm.	Journ. des Débats, 3 et 29 Avril; Constitutionnel, 28 Mars, 2 et 18 Avril, 2 Mai; Colla; Allgemeine Zeitung, Nr. 86, Beil. S. 343, Nr. 91, Beil. S. 362; Antologia, 1832, Jun. p. 311; Communication of M. Mérian to M. Perrey.
— 19. Parma .....	.....	More shocks .....	.....	.....	.....
— 21. Ditto .....	.....	Ditto .....	.....	.....	Ditto.
— 22. Reggio in Calabria .....	.....	Diastrous shocks .....	.....	.....	Ditto.
— 28. Parma .....	.....	More shocks .....	.....	The dual palace was violently shaken .....	Ditto.
— 31. Irkutsk in Siberia .....	.....	A rather severe earth- quake. The first shock lasted nearly a minute, and was scarcely percepti- ble, but the second, which occurred 4 minutes later, made everything in the houses shake vio- lently.	.....	Neither of the shocks was accompanied by any subterranean noise.	.....
7 A.M.	.....	.....	.....	.....	.....
— April, beginning of the month.	Catanzaro in Calabria .....	More shocks, of great violence.	.....	New ruins produced .....	Authorities for March 11.
— 11. 8 A.M.	Kiachta in Siberia .....	A rather severe shock, lasting 45 seconds.	.....	.....	Moniteur, 3 Sept.
— 12. Parma .....	.....	Several shocks, .....	.....	.....	Authorities for March 11.

1832. Apr. 14. Tiflis in Georgia ..... (N. S.) 3 A.M.	Two distinct shocks, followed by others at 4 <sup>h</sup> 52 <sup>m</sup> A.M. and at 3 <sup>h</sup> and 3 <sup>h</sup> 10 <sup>m</sup> P.M.	Accompanied by a noise as if the houses were falling. M. Viehmann observed three shocks at Tiflis in 1832-33.	Memoir on Earthquakes in the Caucasus, by M. Philadelphine, Professor of Physics at Tiflis, translated by M. Kuppfer; Dubois de Montpéroux, Voyage autour du Caucase, t. iii. p. 271. Authorities for March 11. Ditto. Galignani's Messenger, 16th Oct., quoting from a series of Montreal journals, the date of the last of which was 13th Sept. Berliner Spensersche Zeitung, 1837, Nr. 59. Allgemeine Zeitung, Nr. 221. S. 981; Dorfzeitung, Nr. 111. S. 562; v. Hoff.
— 19. Parma ..... — 22. Ditto ..... — In the Nova Scotia ..... middle of the year.	Several shocks ..... Ditto ..... A slight shock .....	.....	.....
— July 2. Lohugbat in Kemaon, Hindostan. 11 P.M.	The earth shook for 12 secs.	Accompanied by a sound like that of rushing water, which lasted three seconds before the shock, and as long after it.	.....
— 20. Lisbon ..... 6 A.M.	A severe shock, lasting about 10 secs.	Cracks appeared in some of the walls, and people were violently shaken in their beds. On the morning of the 15th of this month an extraordinary flux and reflux of the sea was observed at Dantzig, supposed by some to be caused by an earthquake. On the 23rd a tremendous eruption of Vesuvius began, which did not cease until the 16th August, and was followed on the 16th September by another of less energy.	.....
— ... Cotrone in Calabria ..... Aug. 2. Tiflis in Georgia .....	Repeated shocks .....	.....	..... Allgemeine Zeitung, ausserord. Beil. Nr. 345. S. 1379. Plieninger, Jahrsbericht über die Witterungs-Verhältnisse in Würtemberg.
— 7. Vesuvius and the neighbourhood. and 10. ....	Severe and frequent shocks, particularly on these two days.	Accompanying the violent eruption of the volcano, which still continued. Remarkable atmospheric disturbances.	Journ. des Débats, 2 Sept. Bibl. Univ. Avril 1833, p. 350; Archives des Découv. 1832, p. 244; v. Hoff.
— 18. Lohugbat in Kemaon, Hindostan. 7 P.M.	Another vibratory shock, of 5 secs. duration.	The weather was hot and sultry .....	Berliner Spensersche Zeitung, 1837, Nr. 59.
— 31. Langhiramo, Castiglione, and neighbourhood; in Italy (what State?). Also felt at Berceto. About 1 <sup>h</sup> 45 <sup>m</sup> P.M.	Slight shocks, more severe at Monchio-di-Sasso, Campora, and Scurano.	..... Colla.	.....

1.	2.	3.	4.	5.	6.
1832. Sept. Night between 3 and 4.	Poitiers in France .....	A rather severe shock, lasting some secs.			Moniteur, 9 Sept.
— 23. 10 P.M.	Lohgbat in Kemaon, Hindustan.	Another earthquake, as on the 2nd July.			Berliner Spensersche Zeitung, 1837, Nr. 59.
— Oct. 18 or 19. 2 P.M.	In many parts of the kingdom of Saxony, especially in the di- stricts on the Pleisse and Mulde to the Elbe near Dessau. Most distinctly felt at Gross-Hermsdorf in the bailiwick of Borna, west of the Pleisse, and at the quarries of Rochlitz in the valley of the Zwickau Mulde.	A vibratory shock. At Dessau it was like the explosion of a mass of powder.		At Gross-Hermsdorf and the quarries of Roch- litz, accompanied by loud subterranean thun- der. The upper mist in the air suddenly dis- appeared after the earthquake, and the air be- came mild.	Allgemeine Zeitung, ausserord. Beil. Nr. 464. S. 1835; Leipziger Zei- tung, Nr. 256; Kastner's Archiv, B. vi. S. 301 u. 309.
— 31.	On and around Etna ...	Several slight shocks.		In the forests of Aderno di Bronte and Maletto the shocks were so severe that houses were injured. On this day a great eruption of Etna, the first since 1819, began, which did not cease until December.	Leonhard u. Bronn, N. Jahrbuch, 1833. S. 641.
— Nov. 5.	Ditto. Felt even at Ca- tania.	The earth trembled violently.		Accompanied by tremendous explosions, and a revival of the eruption.	Ditto.
— 13.	Zeiz in Saxony .....	A vibratory shock ...		In Dessau, on the evening of this day, there was a thick yellowish fog with a perceptible odour.	Kastner's Archiv, B. vi. S. 309.
— 21. 10 <sup>h</sup> 30 <sup>m</sup> A.M.	On and around Etna ...	A terrible shock. Ten minutes after there followed another, of less violence.		Accompanied by tremendous explosions. At Nicolosi great damage was done. Preceded and followed by heavy rain. Garnier gives the date Dec. 24.	Leonhard u. Bronn, N. Jahrbuch, 1833, S. 641.
— 25.	Ditto .....	Another shock. In the little village of Milo, 18 miles from Catania, se- vere shocks were felt daily in the		Accompanied by subterranean noise as before. A tower, before injured by the earthquake of 1818, was so severely shaken, that three days afterwards it fell.	Ditto.

1832. Nov. 29. 10 A.M.	Nischneitzglak in the Oural. Most violent in the district of the platina washings.	An earthquake. The motion appeared to go from S.W. to N.E., or nearly parallel to the chain of the Oural.	.....	Accompanied at the platina washings by loud noise like thunder, which lasted several seconds. A violent storm at the same time.	.....	Gothaische Zeitung, 1833, Nr. 43.
— Day not given. 11 P.M.	At sea, in 0° 22' S. lat., and 21° 15' W. long. (from Paris).	On board the ship 'La Seine,' Captain Le Marié, a shock was felt, so severe that it was supposed that the vessel had touched upon a shoal.	.....	.....	.....	Dausy in the Comptes Rendus de l'Acad. t. vi. p. 514.
— Dec. 6.	In Bessarabia .....	.....	.....	.....	.....	Pieninger, Jahrsbericht über die Witterungs-Verhältnisse in Würtemberg.
— 10.	Ditto .....	.....	.....	.....	.....	Ditto.
— 14.	In Saxony .....	.....	.....	.....	.....	Ditto.
9 P.M.	17. Compiano in the duchy of Parma, and the neighbourhood.	Two perceptible shocks, followed by a third about midnight.	.....	.....	.....	Colla.
— 18.	Ditto .....	Three more shocks, one of which was severe and of long duration.	.....	No damage done. On the 16th an eruption of Veauvius began, which continued until the 24th.	.....	Ditto; v. Hoff.
4 or 5 A.M.	.....	.....	.....	.....	.....	.....
— 30.	Swansea in S. Wales .....	Four shocks, from S.W. by W. to N.E. by E. Altogether lasted a second and a half.	.....	.....	.....	Gentleman's Magazine, vol. cii. pt. 2. p. 640.
8 20 <sup>th</sup> P.M.	.....	.....	.....	.....	.....	.....
— 31.	Swansea, Neath, Llanello, Caermarthen, and other places in S. Wales; and at Castlebridge, Co. Wexford, Ireland.	.....	.....	.....	.....	.....
In the morning.	.....	.....	.....	.....	.....	.....
—	Huasco in Chili, South America.	.....	.....	.....	.....	Phil. Trans. 1836, p. 21.
1833. Jan. 5.	Solene in Switzerland.	.....	.....	.....	.....	Mérim.
before 11 P.M.	.....	.....	.....	Can this account refer to a different event from the one last recorded?	.....	The Spectator, No. 237. Jan. 12, 1833.



1.	2.	3.	4.	5.	6.
1833, Jan. 11. 1 <sup>h</sup> 50 <sup>m</sup> A.M.	Laybach in Carinthia ...	Two violent shocks, lasting two seconds and a half.			Garnier, <i>Météorologie</i> , p. 170.
— 13.	Lindköping in Sweden ...	Two shocks, which lasted about 10 seconds.		The following night, near the bridge of Montala, the water of the river ceased to flow and was raised up into a kind of sea. The bed of the river could be passed dryshod, although in general 60,000 tons of water pass under this bridge per minute. The phenomenon was supposed to be connected with the earth- quake.	Ditto.
— 14.	In Saxony (in the ori- ginal erroneously Switzerland), at Ma- chern, Brandis, Pu- chace, and other ad- joining villages in the neighbourhood of Leipzig.	An earthquake, which consisted of a se- vere shock from S. to S.W. (?), lasting nearly 2 seconds.		The shock was accompanied by a dull explosion like a blast in a stone quarry, followed by a rolling as of distant thunder, or like the noise of a carriage.	Ditto, p. 171.
Feb. 5. Some minutes past 5 A.M.	Noirmoutiers in the de- partm. Charente.	Two shocks. The first was the most severe, and lasted 6 or 7 seconds. It was followed 7 or 8 seconds later by the second.	The second shock, re- acting on the sea, communicated a perceptible motion to the vessels.	The first shock was taken for the passage of a carriage on the pavement. The subterranean noise passed from S. to N.	Ditto; Journ. des Débats, 13 Fév.
— 7.	In the West Indies ...	A slight shock.			L'Institut, 29 Juin; Garnier, p. 172.
0 <sup>h</sup> 30 <sup>m</sup> A.M.	Island of Antigua ...	Lasted nearly 30 secs.		In all probability this refers to the same event as that last mentioned.	Annual Register, 1833, p. 71.
12 at night.	In the West Indies ...	A moderate shock			L'Institut, 29 Juin; Garnier, p. 172.
8 <sup>h</sup> 45 <sup>m</sup> P.M.	Ditto	Two severe shocks			Ditto.
2 <sup>h</sup> 30 <sup>m</sup> A.M.	Friedrichshafen on the Lake of Constance, and neighbourhood.	A shock		Accompanied by a rolling noise	Mérian; Pflenzinger, <i>Jahrsbericht über die Witterungs-Verhältnisse in Württemberg.</i>
3 <sup>h</sup> 28 <sup>m</sup> A.M.	Also (3 <sup>h</sup> 30 <sup>m</sup> ) at Bi-				

1833. Mar. 20.	Württemberg?). Glengarry, Inverness-shire.						D. Milne's Catalogue of British Earthquakes, <i>loc. cit.</i> L'Institut, 29 Jun; Garnier, p. 172.
— 23.	In the West Indies	Another shock					
10 <sup>a</sup> 30 <sup>m</sup> P.M.		A slight undulatory shock from S.E. to N.W., followed, 7 minutes after, by a second, in the same direction and lasting 4 secs.					
— 24.	Parma						
9 <sup>a</sup> 15 <sup>m</sup> P.M.							
—	Murray Bay and other places on the shores of the Gulf of St. Lawrence.	Very many shocks during these two months.					
— and April.							
— April.	Horsham in Sussex	A shock of earthquake					Trans. Geol. Soc. (London) 2nd series, vol. v. p. 98, note.
About the 2nd (taken from a London letter of the 10th), 8 <sup>a</sup> 15 <sup>m</sup> P.M.							
— 4.	Vicenza in Italy	A severe shock, preceded at about 1 <sup>h</sup> 15 <sup>m</sup> by a slighter one. Both were undulatory.					
— 4 <sup>h</sup> 18 <sup>m</sup> A.M.		A shock which lasted three seconds.					
— 6.	At Algiers	Another shock, stronger than the last.					
About 10 <sup>a</sup> 30 <sup>m</sup> P.M.							
— 7.	Ditto						
— 3 A.M.							
— 15.	In the West Indies. The island of St. Christopher's is specified.	Rather a severe shock. Lasted some seconds, and was followed by several others of less violence.					L'Institut, 29 Jun; Garnier, p. 172; Annual Register, 1833, p. 71.
9 <sup>a</sup> 45 <sup>m</sup> P.M.							

1.	2.	3.	4.	5.	6.
1832. Mar. 11, 12, 13, 14, and 15.	Assise, La Bastia, La Cannara, Catanzaro, Cotrone, Monte- Leone, Reggio, Milan, Mantua, Verona, Reg- gio (in Modena), Ge- noa, and Parma.	Violent and repeated shocks. At Milan, Mantua, Verona, Reggio, and Genoa, they were felt from the 11th to the 13th, and at Parma daily from the 11th to the 17th. At the latter place they were in the direc- tion of the magne- tic meridian. At Giornico, Bellin- zone, and Lugano, on the 13th, after 3 P.M.		La Bastia and La Cannara were completely ruined, and at many other places great damage was done. At the time of the shocks of the 14th and 15th the waters of the lake of Dsirma in Russia were extraordinarily disturbed, and a noise was heard like that of a storm.	Journ. des Débats, 3 et 29 Avril; Constitutionnel, 28 Mars, 2 et 18 Avril, 2 Mai; Colla; Allgemeine Zeitung, Nr. 86, Beil. S. 343, Nr. 91, Beil. S. 362; Antologia, 1832, Jun. p. 311; Communication of M. Mérian to M. Ferrey.
— 19.	Parma	More shocks			
— 21.	Ditto	Ditto			Ditto.
— 22.	Reggio in Calabria	Diastrophic shocks			Ditto.
— 28.	Parma	More shocks			Ditto.
— 31.	Irkutsk in Siberia	A rather severe earth- quake. The first shock lasted nearly a minute, and was scarcely percepti- ble, but the second, which occurred 4 minutes later, made everything in the houses shake vio- lently.		The ducal palace was violently shaken Neither of the shocks was accompanied by any subterranean noise.	Ditto. Ditto. Ditto.
7 A.M.					
— April.	Catanzaro in Calabria	More shocks, of great violence.		New ruins produced	Authorities for March 11.
Beginning of the month.					
— 11.	Kiacita in Siberia	A rather severe shock, lasting 45 seconds.			Moniteur, 3 Sept.
8 A.M.					
— 12.	Parma	Several shocks			Authorities for March 11.

1832. Apr. 14. Tiflis in Georgia ..... (N. S.) 3 A.M.	Two distinct shocks, followed by others at 4 <sup>h</sup> 52 <sup>m</sup> A.M. and at 3 <sup>h</sup> and 3 <sup>h</sup> 10 <sup>m</sup> P.M.	Accompanied by a noise as if the houses were falling. M. Viehmann observed three shocks at Tiflis in 1832-33.	Memoir on Earthquakes in the Caucasus, by M. Philadelphine, Professor of Physics at Tiflis, translated by M. Kuppfer; Dubois de Montpereux, Voyage autour du Caucase, t. iii. p. 271. Authorities for March 11. Ditto. Galignani's Messenger, 16th Oct., quoting from a series of Montreal journals, the date of the last of which was 13th Sept. Berliner Spenerache Zeitung, 1837, Nr. 59.
— 19. Parma ..... — 22. Ditto ..... — In the middle of the year.	Several shocks ..... Ditto ..... A slight shock.		
— July 2. Lohugbat in Kemaon, Hindostan. 11 P.M.	The earth shook for 12 secs.	Accompanied by a sound like that of rushing water, which lasted three seconds before the shock, and as long after it.	
— 20. Liabon ..... 6 A.M.	A severe shock, lasting about 10 secs.	Cracks appeared in some of the walls, and people were violently shaken in their beds. On the morning of the 15th of this month an extraordinary flux and reflux of the sea was observed at Dantzic, supposed by some to be caused by an earthquake. On the 23rd a tremendous eruption of Yeuvius began, which did not cease until the 16th August, and was followed on the 16th September by another of less energy.	Allgemeine Zeitung, Nr. 221. S. 881; Dorfzeitung, Nr. 111. S. 562; v. Hoff.
— ... Cotrone in Calabria ...	Repeated shocks.		Allgemeine Zeitung, ausserord. Beil. Nr. 345. S. 1379.
— Aug. 2. Tiflis in Georgia .....			Plieninger, Jahrbuch über die Witterungs-Verhältnisse in Würtemberg.
— 7 Vesuvius and the neighbourhood. and 10.	Severe and frequent shocks, particularly on these two days.	Accompanying the violent eruption of the volcano, which still continued. Remarkable atmospheric disturbances.	Journ. des Débats, 2 Sept. Bibl. Univ. Avril 1833, p. 350; Archives des Découv. 1832, p. 244; v. Hoff.
— 18. Lohugbat in Kemaon, Hindostan. 7 A.M.	Another vibratory shock, of 5 secs. duration.	The weather was hot and sultry	Berliner Spenerache Zeitung, 1837, Nr. 59.
— 31. Langhiramo, Castagna-About 1 <sup>h</sup> 45 <sup>m</sup> A.M.	Slight shocks, more severe at Monchio-di-Susso, Campora, and Scurano. Berceto.		Colla.

1.	2.	3.	4.	5.	6.
2. Sept. at between and 4.	Poitiers in France .....	A rather severe shock, lasting some secs.	.....	.....	Moniteur, 9 Sept.
— 23. 9 P.M.	Loingbat in Kemaon. Hindustan.	Another earthquake, as on the 2nd July.	.....	.....	Berliner Spensersche Zeitung, 1837, Nr. 59.
— Oct. 18	In many parts of the kingdom of Saxony,	A vibratory shock. At Dessau it was like	.....	.....	Allgemeine Zeitung, ausserord. Beil. Nr. 464. S. 1855; Leipziger Zei- tung, Nr. 256; Kastner's Archiv, B. vi. S. 301 u. 309.
19. 2 P.M.	especially in the di- stricts on the Pleisse and Mulde to the Elbe near Dessau. Most distinctly felt at Gross-Hernsdorf in the balliwick of Borna, west of the Pleisse, and at the quarries of Rochlitz in the valley of the Zwickau Mulde.	the explosion of a mass of powder.	.....	At Gross-Hernsdorf and the quarries of Roch- litz, accompanied by loud subterranean thun- der. The upper mist in the air suddenly dis- appeared after the earthquake, and the air be- came mild.	
— 31.	On and around Etna ...	Several slight shocks.	.....	In the forests of Aderno di Bronte and Maletto the shocks were so severe that houses were injured. On this day a great eruption of Etna, the first since 1819, began, which did not cease until December.	Leonhard u. Broun, N. Jahrbuch, 1833. S. 641.
— Nov. 5.	Ditto. Felt even at Ca- tania.	The earth trembled violently.	.....	Accompanied by tremendous explosions, and a revival of the eruption.	Ditto.
— 13.	Zeiz in Saxony .....	A vibratory shock ...	.....	In Dessau, on the evening of this day, there was a thick yellowish fog with a perceptible odour.	Kastner's Archiv, B. vi. S. 309.
— 24. A 30 <sup>m</sup> A.M.	On and around Etna ...	A terrible shock. Ten minutes after there followed another, of less violence.	.....	Accompanied by tremendous explosions. At Nicolosi great damage was done. Preceded and followed by heavy rain. Garnier gives the date Dec. 24.	Leonhard u. Broun, N. Jahrbuch, 1833, S. 641.
— 25.	Ditto .....	Another shock. In the little village of Milo, 18 miles from Catania, se- vere shocks were felt daily up to the	.....	Accompanied by subterranean noise as before. A tower, before injured by the earthquake of 1818, was so severely shaken, that three days afterwards it fell.	Ditto.

1832. Nov. 29. 10 A.M.	Nischneitzgilak in the Ural. Most violent motion appeared to go from S.W. to N.E., or nearly parallel to the chain of the Ural.	Accompanied at the platina washings by loud noise like thunder, which lasted several seconds. A violent storm at the same time.	Gothaische Zeitung, 1833, Nr. 43.
— Day not given. 11 P.M.	At sea, in 0° 22' S. lat., and 21° 15' W. long. (from Paris).	On board the ship 'La Seine,' Captain Le Marié, a shock was felt, so severe that it was supposed that the vessel had touched upon a shoal.	Daussey in the Comptes Rendus de l'Acad. t. vi. p. 514.
— Dec. 6.	In Besarabia		Pieninger, Jahrsbericht über die Witterungs-Verhältnisse in Würtemberg.
— 10.	Ditto		Ditto.
— 14.	In Saxony		Ditto.
— 17.	Compians in the duchy of Parma, and the neighbourhood.		Colla.
9 P.M.			
— 18.	Ditto		
4 or 5 A.M.		No damage done. On the 16th an eruption of Veauvius began, which continued until the 24th.	Ditto; v. Hoff.
— 30.	Swansea in S. Wales		
8 20 P.M.		Preceded by a noise like the distant firing of heavy artillery. This sound was heard two or three seconds before the shock.	Gentleman's Magazine, vol. cii. pt. 2. p. 640.
— 31.	Swansea, Neath, Llan-dover, Caermarthen, and other places in S. Wales; and at Castle-bridge, Co. Wexford, Ireland.		
In the morning.		Can this account refer to a different event from the one last recorded?	The Spectator, No. 237. Jan. 12, 1833.
—	Huasco in Chili, South America.		Phil. Trans. 1836, p. 21.
1833. Jan. 5. before 11 P.M.	Solene in Switzerland.		Mérim.

1.	2.	3.	4.	5.	6.
3. Jan. 11. ' 50 <sup>m</sup> A.M.	Laybach in Carinthia ...	Two violent shocks, lasting two seconds and a half.			Garnier, <i>Météorologie</i> , p. 170.
— 13.	Linköping in Sweden...	Two shocks, which lasted about 10 seconds.			Ditto.
— 14.	In Saxony (in the ori- ginal erroneously Switzerland), at Ma- chern, Brandis, Pu- chace, and other ad- joining villages in the neighbourhood of Leipzig.	An earthquake, which consisted of a se- vere shock from S. to S.W. (?), lasting nearly 2 seconds.			Ditto, p. 171.
— Feb. 5. no minutes at 5 A.M.	Noirmoutiers in the de- partm. Charente.	Two shocks. The first was the most severe, and lasted 6 or 7 seconds. It was followed 7 or 8 seconds later by the second.			Ditto; Journ. des Déléats, 13 Fév.
— 7. ' 30 <sup>m</sup> A.M.	In the West Indies .....	A slight shock .....			L'Institut, 29 Juin; Garnier, p. 172.
— 8. ! at night.	Island of Antigua .....	Lasted nearly 30 secs. ....			Annual Register, 1833, p. 71.
— 10. ' 45 <sup>m</sup> P.M.	In the West Indies .....	A moderate shock .....			L'Institut, 29 Juin; Garnier, p. 172.
— 14. ' 30 <sup>m</sup> A.M.	Ditto .....	Two severe shocks .....			Ditto.
— 27. ' 28 <sup>m</sup> A.M.	Friedrichshafen on the Lake of Constance, and neighbourhood. Also (3 <sup>a</sup> 30 <sup>m</sup> ) at Bi- berach, Schneeberg.	A shock .....			Mérian; Plieninger, <i>Jahresbericht über die Witterungs-Verhältnisse in Württemberg.</i>

1833. Mar. 20.	Württemberg?). Glengarry, Inverness- shire.					D. Milne's Catalogue of British Earthquakes, <i>loc. cit.</i> L'Institut, 29 Juin; Garnier, p. 172.
— 23.	In the West Indies .....	Another shock .....				
10 <sup>h</sup> 30 <sup>m</sup> P.M.						
— 24.	Parma .....	A slight undulatory shock from S.E. to N.W., followed, 7 minutes after, by a second, in the same direction and last- ing 4 sec.			The atmosphere was calm, and the sky obscured by clouds, some of which were very much elongated. A gust of wind of considerable force had preceded the shock by a few mi- nutes, and caused the thermometer to rise 1° R.	Colla.
—	Murray Bay and other places on the shores of the Gulf of St. Law- rence.	Very many shocks du- ring these two months.				Trans. Geol. Soc. (London) 2nd series, vol. v. p. 98, note.
— and April.	Horsham in Sussex ...	A shock of earthquake			More perceptible in some houses than in others. Some persons were greatly frightened, while others felt nothing.	Garnier, p. 171.
— April.	About the					
— 2nd (taken	from a Lon-					
— don letter of	the 10th), 8 <sup>h</sup>					
— 15 <sup>m</sup> P.M.						
— 4.	Vicenza in Italy .....	A severe shock, pre- ceded at about 1 <sup>h</sup> 15 <sup>m</sup> by a slight one. Both were undulatory.			The bell of the great tower sounded of itself ...	Ditto.
— 4 <sup>h</sup> 18 <sup>m</sup> A.M.		A shock which lasted three seconds.				Ditto.
— 6.	At Algiers .....	Another shock, stronger than the last.				Ditto.
— About 10 <sup>h</sup>						
— 30 <sup>m</sup> P.M.						
— 7.	Ditto .....	Rather a severe shock. Lasted some se- conds, and was fol- lowed by several others of less vio- lence.				L'Institut, 29 Juin; Garnier, p. 172; Annual Register, 1833, p. 71.
— 3 A.M.						
— 9 <sup>h</sup> 45 <sup>m</sup> P.M.	In the West Indies. The island of St. Christo- pher's is specified.					



1.	2.	3.	4.	5.	6.
1833. Apr. 17. 0 <sup>h</sup> 30 <sup>m</sup> A.M.	Cartagena, Orihuela, Almoradi, and Torre- vieja in Spain, and at some points of the coast of Africa, oppo- site to Cartagena.	Three rather severe vibratory shocks.	.....	In Murcia, especially at Torrevieja and Almoradi, earthquake shocks had not ceased to be occa- sionally felt since 1829.	Garnier, p. 172.
— 25. About 10 <sup>h</sup> 30 <sup>m</sup> A.M.	Huasco in the province of Coquimbo, Chili, between the 28th and 29th degrees of S. lat.	A violent earthquake. A second shock fol- lowed, but after what interval is not said.	.....	A large part of the houses in this district were thrown down, and the rest greatly injured. The second shock completed the destruction of the church, which had been much injured by the first.	Ditto.
— May 4. 11 P.M.	In the West Indies .....	A slight shock, but of considerable dura- tion.	.....	Preceded by great drought .....	Ditto; L'Institut, 29 Juin.
— 21. 2 P.M.	Frascati and Monte Poz- zio in the environs of Rome.	A shock of earthquake	.....	No damage done.....	Garnier, p. 172.
— June 11. 7 A.M.	North of Manchester .. Confreville, Caillet, An- gerville, Bayeul, Saint- Maclo, Limpville, and other communes in the canton of Goder- ville, arrondissement of Havre, departm. of Seine-Inférieure.	Violent shocks, which lasted but a few seconds, alarmed the inhabitants.	.....	.....	D. Milne's Catalogue, <i>loc. cit.</i> Journ. des Débats, 2 Juillet; Gar- nier, p. 172.
— July 5. 1 <sup>h</sup> 10 <sup>m</sup> A.M.	Parma .....	A slight undulatory shock, from E. to W.	.....	.....	Colla.
— Aug. 12 and 13.	Vesuvius .....	Some shocks .....	.....	Accompanying an eruption of the volcano .....	Journ. des Débats, 3 Sept.
— About noon.	Utrecht in Holland.....	A slight shock.....	.....	.....	Garnier, p. 173.
— 26. 5 <sup>h</sup> 30 <sup>m</sup> or 6 P.M., and again at 11 and 12, the latter being the most vio-	Calcutta, Agra, Luck- now, Tirhoot, Pur- neah, Patna, Buxar, Allahabad, Monghyr, Katmandu, &c.; in fact all over the cen- tre and east of northern	A violent earthquake. At Calcutta there were three shocks, at Lucknow four, at Purneah three, and at each of the other places men-	.....	Water was in many places thrown out of the tanks, as at Tirhoot from a tank of 4 feet deep, in which the surface of the water was 3 feet below the edge. Birds were thrown out of their nests, cattle were greatly frightened, and men could scarcely keep their feet. At Buxar the shocks were felt with great violence on one	Asiatic Journal, N. S. vol. xiii. pt. 2. pp. 156 & 195.

lent. The time of the principal shock for several of the places was as follows, reducing to Calcutta time:—	tioned, several shocks of great violence, besides numerous slighter ones. The most violent were those at the hours mentioned, but the slighter ones continued to recur at intervals until the following October, some of the shocks during that time being rather severe. Each of the shocks lasted but a short time, generally 3 or 4 secs., but some are mentioned of a minute's duration. At Tirhoot the motion was from E. to W., at Buxar apparently from N. to S., at Patna apparently from E. to W., at Calcutta from N.E. to S.W., at Katmandu in Nepal apparently from E. to W. All the shocks came from E. or N.E. At Katmandu the motion lasted about forty seconds. At Purneah the direction is given as S. to E. At most of the places the earth	side of the river, and but very little on the other. Accompanied in many places by loud subterranean noises, especially at Katmandu, where the most violent shock (at 11 p.m.) was attended by a noise compared to that of 100 pieces of artillery. Here also (at Katmandu) the trees and even the smallest shrubs waved in the air from their very roots. Above 100 houses were levelled in a moment, and at other places still greater loss of buildings and life occurred. At Chupra a chasm opened in the earth of considerable length and depth. Preceded by very close and oppressive weather, and followed in several places by wind and rain.
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1.	2.	3.	4.	5.	6.
1833. Sept. 18. Chichester, Birdham, and Liphook, in Dorsetshire.		<p>was in almost continual agitation for twenty-four hours. The shock produced a tremor, followed by an undulation. To a person in an old cottage it resembled the sudden turning of a powerful steam-engine or thrashing machine. In solid buildings it was like the fall of a weighty body, followed by a prolonged undulation.</p>	<p>The shock was felt in a boat in Chichester harbour, as if it had struck a rock.</p>	<p>Preceded by the sound of a rushing wind. Barometer 29.25 in. The air was very sultry, warm, and still. Wind from S. and S.W. On the previous evening a brilliant aurora, with meteors falling. Pheasants crowded.</p>	<p>D. Milne's Catalogue, <i>loc. cit.</i></p>
— — — Arica and Saena in Peru. An earthquake .....				<p>The danger was announced by the baying of dogs and baying of asses. The day before, the atmosphere had been frightfully still and stagnant. With the exception of some puffs of wind at rare intervals, which were felt as well in the interior of apartments as without, the air on the 18th was completely still at Saena. The shocks left a great number of empty bottles standing in the places which they had occupied, but their corks were found strewn on all sides upon the floor. None of the empty bottles were thrown down, but full ones, on the contrary, were thrown off their shelves and broken. The varnish on a new table recovered its fluidity so far that the next day the table was surrounded by viscid drops. A large part of the water contained in some jars buried in the ground was thrown out, although the surface of the water was 3 or 4 ft. below the rim of the jars. It was remarked that after a shock, whether great or slight, the dogs of the town proceeded to quench their thirst at the nearest pool.</p>	<p>Garnier, p. 173.</p>

1833. Sept. 20. Meerut in Bengal	The only remarkable shock since that of the 26th of August. Lasted about fifteen seconds.			Asiatic Journal, N. S. vol. xiii. pt. 2. p. 159.
Oct. 4. Monghyr and Jionpoor in Bengal. 7 or 8 <sup>h</sup> 30 <sup>m</sup> A.M.	At Monghyr the shock was very violent and lasted a minute and a half. At Jionpoor it was sudden and smart, lasting only a few seconds.			Ditto, p. 241.
9. Isoire in the departm. Puy-de-Dôme. 1 <sup>h</sup> 15 <sup>m</sup> P.M.	Rather a severe shock.		Accompanied by noise. The weather, which before looked stormy, then cleared up.	Journ. des Débats, 15 et 26 Oct.; France Pittoresque, t. iii. p. 3.
15. Ditto	Several more shocks. They were frequent in Auvergne, at Cantal, and in the Haute-Loire, from the 8th to the 22nd. That of the 18th extended as far as Roanne.		Accompanied by an indistinct bellowing noise at Clermont, Isoire, and the neighbourhood. It was remarked that these shocks in Auvergne did not extend beyond the mountain chain of the Puy-de-Dôme, and that they had been preceded by two years of great drought.	Ditto; Annales de l'Auvergne, 1833.
18. Goruckpoor in Bengal. 4 <sup>h</sup> 40 <sup>m</sup> A.M.	Very violent shock, apparently from E. to W. Lasted nearly a minute.			Asiatic Journal, N. S. vol. xiii. pt. 2. p. 241.
24. Singapore 8 <sup>h</sup> 35 <sup>m</sup> P.M.	First a slight shock, then a tremulous motion of the earth which lasted about a minute, and then two other shocks still slighter than the first.			Ditto, vol. xiv. pt. 2. p. 21.
Nov. 13. Chichester in Dorsetshire. 2 <sup>h</sup> 40 <sup>m</sup> A.M.	The shock consisted of a number of undulations rapidly succeeding each other. Followed by another and much		Preceded by a distinct low sound. On the previous day there had been a thick fog, which came from the east and continued up to 9 A.M. on the 13th. This thick fog was said by an observer to be precisely similar to that which accompanied the Lisbon earthquakes of 1807	D. Milne's Catalogue of British Earthquakes, loc. cit.

1.	2.	3.	4.	5.	6.
1833. Nov 24. (Oct. 24?). At night.	Island of Java, and still more in Sumatra.	slightershock about 6 A.M.		and 1816. The fog commenced on the 12th, succeeding heavy rain on the 11th of Nov. Numerous meteors were observed in North America at 3 A.M. on the 13th.	Asiatic Journal, N. S. vol. xiv. pt. 2. p. 263.
Dec. 2. In the morning.	In the neighbourhood of Haarlem in Holland.	A shock of earthquake, which lasted twenty to twenty-five seconds.		Great foundations produced by the overflowing of one of the rivers, as also a mountain lake, consequent on the earthquake. The volcano of Bocket Kaba in Sumatra reported to be in a state of activity.	Garnier, p. 173.
Night between 18 & 19.	In Bohemia.	Some slight shocks said to have been felt.		During a terrible hurricane. A subterranean noise was said to have been heard.	Moniteur, 20 Janv. 1834.
1834. Jan. 3. Between 7 & 8 P.M.	Fort-Opus in Dalmatia.	Three great shocks, followed by several others the next day.			Journ. des Débats, 4 Fév.; Colla.
—	In the neighbourhood of Soleure, Switzerland.	A shock			M. Studer's Catalogue.
—	Ditto	Ditto			Ditto.
—	Ditto	Ditto			Ditto.
—	Ditto	Ditto			Ditto.
—	Parma and the environs.	Two slight shocks, lasting about three seconds. From S.E. to N.W.			Colla.
6 <sup>h</sup> 15 <sup>m</sup> P.M.					
—	Sabondoy near Pasto and Santiago in S. America.				Trans. Geol. Soc. (London) 2nd series, vol. v. p. 610.
—	In the West Indies.				
In the evening. In Martinique at 7 <sup>h</sup> 45 <sup>m</sup> P.M.		A shock producing an undulatory motion of the ground.		In the night between the 21st and 22nd the town of Pasto in Upper Peru was completely destroyed by violent earthquakes. (This account doubtless refers to the event last recorded.) Santa Martha is said to have been destroyed by an earthquake, perhaps the same, and another at Pasto on the 1st of March.	L'Institut, Nr. 54; Archives des Découv. 1834, p. 197; Moniteur, 4 et 6 Oct.

<p>Liphook, Farnhurst, Petworth, Pulborough, Bognor, Portsmouth, and Gosport. The centre of intensity supposed to be a few miles N.W. of Winchester.</p>	<p>... movements with two-thirds of a second intervening between each. The undulation at Stanstead House was from W. to E., and appeared to be single. At Pulborough three distinct shocks were felt in quick succession.</p>	<p>At Stanstead Hall a bed was lifted up. The barometer stood at 30 in., and had previously risen and fallen very capriciously, without any corresponding change of weather. The morning of the previous day was rainy, foggy, and warm. At the time of the shock the air was calm, but instantly after, the wind rose and blew strongly from S.W., with rain and lightning. The same humid weather prevailed up to the close of January, and the season was nearly a fortnight in advance up to the end of March. For ten weeks before the occurrence of the shock, 23rd of January 1834, the wind had pertinaciously prevailed from the S.W., and it had rained almost daily to a depth of nearly 12 inches (1).</p>	<p>Accompanied by a kind of subterranean bellowing noise.</p>
<p>Feb. 2. 3<sup>h</sup> 2<sup>m</sup> A.M.</p>	<p>Edelsberg in Carinthia. A severe shock. The motion was rather oscillatory than undulatory. Direction — N. to S. Lasted twenty or thirty seconds.</p>	<p>Also felt at Trieste. Another shock, instantaneous, and very slight.</p>	<p>Colla, Bibliot. Ital. t. 78.</p>
<p>9<sup>h</sup> 49<sup>m</sup> A.M.</p>	<p>Lancaster in Pennsylvania, United States.</p>	<p>A shock which shook all the houses and extinguished the lights.</p>	<p>Compared by the inhabitants to the explosion of a powder mill.</p>
<p>1<sup>h</sup> 30<sup>m</sup> A.M.</p>	<p>Pontremoli in Tuscany.</p>	<p>A severe shock, with undulations — "soubresauts."</p>	<p>Some damage done.</p>
<p>Especially at 2<sup>h</sup> 30<sup>m</sup> P.M.</p>	<p>Ditto. The centre of disturbance seemed to be about Mt. Molinatico.</p>	<p>At Pontremoli all the buildings were seriously injured, and in some villages five or six miles to the south, belfries, churches, and ill-built houses fell. Four persons perished beneath</p>	<p>Journ. des Débats, 9 Mars; Colla; Gargioli, Descrizione del terremoto di Pontremoli; Annali di Statistica di Milano, vol. xl.</p>

1.	2.	3.	4.	5.	6.
1834. Feb. 15. About 8 (A.M.).	Pontremoli in Tuscany.	At Parma the direction was S.W. to N.E. The most severe of the shocks was first vertical, then horizontal from N.W. to S.E., and lasted twelve seconds. About 3 <sup>h</sup> two other violent shocks. A rather severe shock at Pontremoli. About 1 <sup>h</sup> 30 <sup>m</sup> and 9 <sup>h</sup> 30 <sup>m</sup> (P.M.), at Parma, several others.		the ruins. The shocks at 2 <sup>h</sup> 30 <sup>m</sup> were preceded at Pontremoli by a very loud noise.	
— 16. Ditto		Other slighter shocks at Pontremoli at intervals of three hours.			Journ. des Débats, 9 Mars; Colla; Gargioli, Descrizione del tremoto di Pontremoli; Annali di Statistica di Milano, vol. xl.
— 17. Ditto A little after 5 P.M.		A very severe shock. At Borgotaro at least forty (forty-four?) shocks were counted altogether. The first (at 2 <sup>h</sup> 30 <sup>m</sup> P.M.) was felt more or less throughout Upper Italy. Slight but frequent shocks occurred up to the end of the month in the territories of Pontremoli and Volterra.		The inhabitants fled from their houses. These shocks were always preceded or accompanied by dull explosions.	Ditto.
— 20. 2 A.M.	Chichester in Dorset-shire.	A slight shock.		The report on these earthquakes at Chichester from which Mr. Milne has copied, observes that in May 1833 (though the previous series had	D. Milne's Catalogue, loc. cit.

1834. Mar. 9.	At the mouth of the Kouban, at Anapa, and on the neighbouring part of the coast of the Black Sea.	An earthquake	tender there was rain, during which the thermometer fell nearly to 28 inches. The temperature of the ground had been unprecedentedly high for mid-winter, and the water in the wells 2° above the average.	Plieninger, Jahrsbericht über die Witterungs-Verhältnisse in Würtemberg.
— About 10 <sup>h</sup> 30 <sup>m</sup> P.M.	At Acapulco. Felt also at the same hour at Mexico.	At Acapulco a severe vertical shock, known in the country as "secousse de trepidation"; said to be of the usual kind. Followed by other shocks for several days in succession. At Mexico, an undulatory movement which lasted more than two minutes.	On the third day after this, the sea retired about thirty-three metres from the shore, and then returned <i>gradually</i> to its ordinary level.	Dupetit-Thouars, Voy. de la Vénus, t. II. p. 213.
— 21. 0 <sup>h</sup> 30 <sup>m</sup> A.M.	Ranen in Helgeland	A severe shock, followed by a second at 3 <sup>h</sup> 30 <sup>m</sup> P.M.	Walls were shaken, and doors slammed to. M. Keilhan supposes the day of the month to be wrongly reported.	Morgenblad, 1835, Nr. 661; Keilhan.
— ...	In the neighbourhood of Pontremoli and Volterra, in Tuscany.	More shocks		Colla.
— April 13.	Gibraltar, Cadiz, and Algairaz.	A slight shock.		Ditto, Bibl. Ital. t. lxxviii.
— to 17.	In the district of Volterra, Tuscany, especially at Borgotaro.	Violent shocks.	Accompanied by loud explosive noises.	Colla.
— May 2. Noon.	Pontremoli in same district.	A violent shock		Ditto.



1.	2.	3.	4.	5.	6.
1834. May 6. 11 P.M.	Keni and Kischenew in Bessarabia.	A shock .....	.....	Preceded by a loud noise at Kischenew .....	Colla, Bibl. Ital. t. lxxviii.
— 8 A.M.	Pontrenoli in Tuscany.	Very perceptible shocks, followed by slighter ones.	.....	.....	Colla.
— — —	Kischenew in Bessarabia.	Another shock.....	.....	.....	Pieminger, Jahrbuch über die Witterungs-Verhältnisse in Würtemberg.
— 16. 5 <sup>h</sup> 25 <sup>m</sup> P.M.	Borgotaro in Tuscany.	A violent shock, with "soubresauts," lasting four or five seconds. At the same physical instant, a very slight shock at Parma.	.....	Preceded by subterranean noise (rombo). The inhabitants fled out of the houses. The evening before, magnetic disturbances had been observed at Parma.	Colla.
— 22. and three following days.	Santa Martha in S. America.	The first and most severe shock lasted three-quarters of a minute. Altogether sixty shocks during the four days.	.....	The earth cracked in fissures which in many places were 6 inches wide, and from which hot and sulphurous vapour was ejected.	Annual Register, 1834, p. 71.
— 23. — — —	Jerusalem .....	A very severe shock .....	.....	Some churches and other buildings were injured.	Colla.
— 26. June 6.	Borgotaro in Tuscany.	A slight shock.....	.....	.....	Ditto.
— — —	Ditto .....	A very perceptible shock.	.....	.....	Ditto.
— 18. — — —	In the island of Cephalonia.	Severe shocks .....	.....	Some houses thrown down .....	Ditto.
— 21. — — —	Pontrenoli in Tuscany.	A severe shock .....	.....	.....	Ditto.
0 <sup>h</sup> 30 <sup>m</sup> P.M. — July 4. 1 <sup>h</sup> 45 <sup>m</sup> A.M.	Parma, Milan, Genoa, and throughout Upper Italy.	At Parma a very perceptible undulatory shock, from S.W. to N.E., lasting more than ten seconds. At S. Vitale-de-Baganza (twelve miles S.W. of Parma) it was very vio-	.....	At Milan a distinct hissing or whistling noise was heard in the air.	Ditto; Journ. des Débats, 13 Juillet.

1834. July 4. (At same hour?)	Brest in France	tion was slight, undulatory, and from N.W. to S.E. Several more shocks were felt the next day.	A very distinct shock.			Colla, Bibl. Ital.
8.	Rungpoor in Bengal					Asiatic Journal, N. S. vol. xiii. pt. 2. p. 91.
21.	Ditto	Two shocks			Fissures opened in the ground, from which smoke and flames were thrown out, and then the fissures closed.	Ditto.
Aug. 2. 8 <sup>h</sup> 40 <sup>m</sup> A.M.	Borgotaro in Tuscany	A slight shock				Colla.
Night between 16 and 17. Midnight.	In Norway. Felt at Christiania, Ilvidesoe, in Tellemarken, at Drammen, Söndmör; Dronheim, Loessoe, in the Gullbrandtadalen and Oesterdal, and at Bergen.	Slight at Christiania, but more severe in the rest of Norway. At Bergenthesock appeared to pass from N.W. to S.E.	A ship off Cape Stat felt a shock as if they had touched upon a shoal.		Beds, doors, and windows were set in motion by vibrations and sudden shocks. At Elverum in the Oesterdal the peasants saw a meteor of extreme brilliancy, which deprived them of sight for some moments. At Bergen also a fire-ball was observed, passing from E. to W., and a boatman of the Sambford saw another, from which sparks seemed to be thrown off. Furniture and even houses were violently shaken.	Morgenblad. 1834, Nrr. 250. 253. 256; Keilhau.
7 and 9 A.M.	Ilvidesoe in Norway	Two shocks, one at each of the hours mentioned.				Ditto, Nr. 250; Keilhau.
	Vesuvius	Three severe shocks			Caused fissures to open on one of the flanks of the volcano.	Moniteur, 16, 19 et 20 Sept.
24.	Ditto	Another shock			Produced great fissures, from which lava and immense quantities of smoke came forth. The volcano was in a state of active eruption during the following days.	Ditto.
25.	In Perthshire, Scotland	A shock				Communication of M. Plénier of Stuttgart to M. Perrey.
27. 10 <sup>h</sup> 15 <sup>m</sup> or 25 <sup>m</sup> P.M.	Along the coast of Hampshire, at Portsmouth, Gosport, Southampton, Chichester, &c.	At Portsmouth and Gosport, violent shocks, lasting 3 or 4 seconds.	The 'Griper' sloop of war, lying in Chichester harbour, was thrown on her side.	At Portsmouth and Gosport, the clouds had been dense in the afternoon, and the atmosphere suffocating, and about 7 to 8 P.M. some peals of thunder were heard. The tempera-		Moniteur, 4 Sept.; D. Milne's Catalogue, loc. cit.

1.	2.	3.	4.	5.	6.
<p>Sept. 3. In Norway .....</p> <p>Christiania, the motion was undulatory, from E. to W., and lasted half a minute. At Eidsvold the earthquake was very severe. It consisted of two shocks, with an interval of eight seconds. The second was the more severe. At Porsgrund three shocks were felt in the space of a minute. The motion was also perceived at Laurvig. At Ilvdesøe there were two very severe shocks. At Ullensvang the shocks lasted three or four seconds, and appeared to be more violent than that of the 17th of August. At Bergen the</p>			<p>derably over to the south. The noise was very great, and the crew were much alarmed, thinking that a lighter had run against her.</p> <p>The shocks were perceived at sea, in the fiord of Christiania.</p>	<p>ture had not been known so high since 1822. At Chichester a low rumbling noise was heard before the shock. The appearance of the sunset was extraordinary, and a West Indian gentleman predicted an earthquake. A whirlwind occurred to the west three hours previously. A man on the shore, south of Chichester, heard a loud report like that of a great gun, and immediately afterwards felt the ground shaking under his feet.</p> <p>At Christiania doors opened, and pictures hung to the walls were set in motion. The shock was particularly felt in the north and east parts of the town. In the observatory of Christiania, built upon porphyritic rock, it was not perceived, while in localities closely adjoining it, which rested on clayey alluvium, it was felt. At Moss articles of furniture were roughly shaken, and at Eidsvold bells rang. At Porsgrund accompanied by a noise in the air. At Ilvdesøe, Nissedal, Hitterdal, and Bøe the inhabitants quitted their houses in alarm. At Loessøe the noise was like that of a carriage passing quickly over pavement. At Ullensvang the houses were violently shaken, but persons in the fields perceived nothing unusual. At Bergen glasses were heard to ring and to rattle together in their presses. At Snaasen no shock was felt, but it was observed that the sky on the western horizon seemed all on fire and constantly lit up by lightning, although the heavens in other directions were clear.</p>	<p>Morgenblad, Nra. 248. 249. 253. 256. 257. 260. 284. 312; Rigstidenden, Nr. 90; Kellhaug.</p>

1834. Sept. Night be- tween 4 and 5.	At Hardanger in Nor- way.	According to some from N.W. to S.E., according to others, from S.E. to N.W.			Keilhau.
— 7.	Jamaica	A very violent earth- quake.			Trans. Geol. Soc. (London) 2nd se- ries, vol. v. p. 610.
— 13.	Niort in the departm. Deux-Sèvres, and the neighbourhood.	A slight vibration			Comptes Rendus de l'Acad. t. i. p. 129.
— 17.	In the islands to the south of Drontheim, Norway.	An earthquake shock			Laing's Travels and Residence in Norway (Lond. Longman, 1851), pt. 1. p. 80.
— 21. 11 <sup>h</sup> 20 <sup>m</sup> A.M.	Chichester	Another earthquake		The day was cold and cloudy, after several days and nights of extraordinary and unseasonably hot weather.	D. Milne's Catalogue of British Earthquakes, <i>loc. cit.</i>
— 25.	Constantinople	Two shocks			Moniteur, 15 Oct.; Journ. des Dé- bats, 24 Oct.
— Oct. 4. 8 P.M.	Bologna. And at the same instant at Par- ma, Padua, and Ve- nice.	A violent shock, suc- ceeded by "sou- bresauts," and then by an undulatory movement which seemed to pass from E.N.E. to W.S.W., lasting about eight seconds. At Parma, Padua, and Venice a slight shock, last- ing two seconds.		Preceded by a very loud hissing noise. The sky was clear, and a very strong cold east wind blew.	L'In- stitut, 5 Nov.; Colla.
— 5. In the morn- ing.	Chichester	A severe shock. The earth quivered for at least 2 minutes.			Annual Register, 1834, p. 152; Journ. des Débats, 30 Oct.
— 6. 3 and 7 A.M.	Cartagena in Spain	Three shocks, two of which occurred at 3, and one at 7 A.M. Followed by others the next day.		Followed the same day by a tremendous storm of thunder, lightning, and rain.	Communication of M. Colla to M. Perrey.

1.	2.	3.	4.	5.	6.
1834, Oct. 10.	Batavia .....	Very violent .....	.....	About thirty miles in the interior, a mountain in part sank into the earth, causing the total destruction of a village at its foot.	Asiatic Journal, N. S. vol. xvi. pt. 2. p. 211.
— 13. About 2 or 3 A.M.	Snaasen in Norway .....	Lasted eight seconds, constantly diminishing in intensity.	.....	Accompanied by a ringing sound .....	Morgenblad, 1834, Nr. 313; Keilbau.
— 13. to 18.	In the canton of Glarens (Glaris?) in Switzerland.	Some slight shocks .....	.....	Mérian gives only the date October 13, 4 <sup>h</sup> 30 <sup>m</sup> A.M. for Glaris.	Colla, Bibl. Ital. t. lxxviii.
— 14. At night.	Kaschau in Hungary ..	Ditto .....	.....	.....	Ditto.
— 15, 16, and 17.	A great part of the N.N.E. of Hungary.	Violent shocks .....	.....	A shock on the 15th at 7 <sup>h</sup> 45 <sup>m</sup> (A.M. or P.M.?) was so severe at Piscatt that many of the houses were rendered uninhabitable. At Mazo-Peter and other places buildings were also ruined. It had rained but thrice in this country since the month of May. The earthquake of the 15th was preceded by dreadful weather (of what kind?).	Ditto.
— 18. Nov. 15 and 16.	Borgotaro in Tuscany... Ditto .....	A slight shock. .... Slight shocks .....	.....	.....	Colla.
— 26. Dec. 8. Before sunrise.	Island of Martinique ... Rome .....	An earthquake .... Some slight shocks, more severe in the mountains of Albano.	.....	.....	Ditto.
— 10.	Agram in Croatia .....	A slight shock, rather stronger at Kouvre. Direction = N.E. to S.W.	.....	Chimnies thrown down .....	Journ. des Déchats, Fév. 1835. Moniteur, 25 Déc. et 2 Janv. suiv.
— 22. 7 <sup>h</sup> 55 <sup>m</sup> P.M.	Kiaichta in Siberia .....	A rather violent shock. Lasted five seconds; direction = N.W. to S.E.	.....	.....	Colla, Bibl. Ital. t. lxxviii.
— 25. Noon.	Montecchio in the Este territory, Montechiaragoto in the Parmesan territory, and the upper hills.	A slight shock. ....	.....	Preceded by a dull noise and accompanied by distant thunder. The houses were violently shaken, but not injured.	Communication of M. Colla to M. Perrey.
			.....	.....	Colla.

1835. Jan. 6. 6 <sup>h</sup> 30 <sup>m</sup> A.M.	Acapulco in Mexico. Also felt at Mexico.	A violent vibratory ("de trepidation") shock. At Mexico the motion was undulatory, as on the 11th March 1834.	The sea exhibited no disturbance.	The whole town was destroyed.....	Dupetit-Thouars, Voyage de la Vé-nus, t. ii. p. 214.
— 12. 7 A.M.	Borgotaro in Tuscany.....	A very perceptible undulatory shock.			Colla.
— 8 A.M.	Chichester .....	A slight shock.			D. Milne's Catalogue, <i>loc. cit.</i>
— 20.	Volcano of Cosiquina in Mexico, and the surrounding district within a radius of more than twenty leagues.	The first shock, followed by others on the 21st and following days.		Accompanying a violent eruption of the volcano. The attendant subterranean noise was heard at places far removed from the scene of the eruption, and the shower of ashes also extended to enormous distances. The eruption began on the 19th, and was most violent on the 23rd.	Comptes Rendus de l'Acad. t. iv. p. 801, t. v. p. 75.
— 21. 2 <sup>h</sup> 5 <sup>m</sup> A.M.	Collechio and Sala, in the Parmesan territory.	A slight shock.			Colla.
— 26. 10 <sup>h</sup> 54 <sup>m</sup> A.M.	Borgo-San-Domino in the Duchy of Parma.	A very slight shock.			Ditto.
— Feb. 5. 8 P.M.	Borgo-S.-Lorenzo in the Mugello, Italy. Also felt at Vicchio.	A rather severe shock, at first vertical, then undulatory, lasting but a few seconds. At 9 <sup>h</sup> , another rather severe shock occurred, and on the following days, slight tremblings.		Preceded by a noise which came from the east. At Borgo-S.-Lorenzo some walls were cracked, but at Vicchio the damage done was more considerable. Perhaps only the same event with that next recorded.	Notizia Manoscritta del Sig. Andreucci di Borgo-S.-Lorenzo, communicated by Sig. Pilla to M. Perrey.
— 6. 7 <sup>h</sup> 50 <sup>m</sup> P.M.	Florence. The centre of disturbance appears to have been situated in the northern part of the Mugello, where, however, there was not much damage done.	A severe shock. Several other slight ones during the evening.			Journ. des Débats, 20 Fév.; Colla.
— 7. 10 <sup>h</sup> 45 <sup>m</sup> (A.M. or P.M.?).	Rome and the environs. 9. At sea, in 0° 57' S. lat., and 25° 39' W. long. (from Paris).	A slight shock.	On board the barque 'La Couronne,' of Liverpool a shock		Colla. Daussey in the Comptes Rendus de l'Acad. t. vi. p. 514.

1.	2.	3.	4.	5.	6.
1835, Feb. 12. At sea, felt very strongly off the coast of Guiana.	14. Santiago and other parts of Chili.		was felt as if the vessel had struck on and grated along a coral reef. On sounding, no bottom was found with 135 fathoms. The ship was going at the rate of six knots with a fine breeze from the E.S.E.		Trans. Geol. Soc. (London), 2nd series, vol. v. p. 610. Ditto; Phil. Trans. 1836, p. 21.
— 20. Santiago, Concepcion, and the rest of Chili. Also felt on Juan Fernandez. Extended N. to S., from Copiapo to Chiloe, and from E. to W., from Mendoza to Juan Fernandez.		A slight oscillation, lasting about 20 seconds. Three oscillations, of which the first was very gentle, and the second and third very violent. Direction, apparently, S.W. to N.E. The earth was not quiet for three days after, and more than 300 shocks were counted between the 20th February and 4th March.	The sea retired from the coast, flowed in again, and again retired, when an enormous wave rolled in to the height of 28 feet above high-water mark, this being followed by another and still larger wave, and that by two small ones. Two eruptions of dense smoke were seen to issue from the sea; and in the place where the second of these occurred a whirlpool was formed in the shape of an inverted cone, as if the sea were turning.	In some places preceded by a rumbling noise; in others none such was heard. Great fissures opened in the earth, from which gases and muddy and salt water were in many places thrown out. The earth is said to have opened and closed rapidly in many places. The direction of the cracks was not uniform, but generally from S.E. to N.W. The loose earth of the valley of the Biobio was everywhere parted from the solid rocks, the opening between them varying from an inch to a foot in width. The coast was permanently elevated to a considerable extent, varying from one to ten feet at different places; on the whole Captain Fitzroy concludes that the land was raised four or five feet in February, and that it returned in April to within two or three feet of its former level. Concepcion, Talcahuano, Chillan, and other towns were thrown down. The earthquake was preceded by fine weather, and followed by storms of wind and rain.	Ditto; Darwin's Journal of Travels in South America, in Voyage of H.M.S. Beagle, p. 372.

1835, Feb. 27, 10 A.M.	Delle, Dannemarie, Mul- house, and other places in the Sundgau, de- partment Haut-Rhin. Not felt at Bâle.	A tremor .....	ing into some cavity in the earth. The earthquake was felt on board vessels 100 miles from the coast.	Mérian.
— Mar. At night.	6. Cagliari in Sardinia.....	Some slight undula- tory shocks from W. to E.	Accompanied by a violent N.W. wind .....	Colla.
— — 6 A.M.	7. Beaumont in the de- partment Vacluse, and Manosque in the Basses-Alpes.	Two shocks, with an interval of six mi- nutes.	.....	Journ. des Débats, 24 Mars.
— — About 9 <sup>h</sup> 15 <sup>m</sup> A.M.	8. Borgotaro in Tuscany...	A strong undulatory shock, lasting 8 sec. Half an hour after, two other shocks, one of which was very slight.	.....	Colla.
— —	12. Different places in Hun- gary.	Violent shocks .....	.....	Ditto.
— — 2 <sup>h</sup> 40 <sup>m</sup> A.M.	16. Borgotaro in Tuscany...	Another slight shock.	.....	Ditto.
— — 2 <sup>h</sup> 7 <sup>m</sup> A.M.	24. Palermo .....	Severe shocks, with "soubresauts."	.....	Ditto.
— — 4 <sup>h</sup> 23 <sup>m</sup> A.M.	Ditto .....	Three other shocks, lasting 5 or 6 sec. The motion was un- dulatory, from N.E. to S.W.	Flashes of lightning darted from a particular group of clouds.	Ditto.
— April 1, 7 P.M.	1. Veauvius, and as far as Naples.	Four shocks .....	Accompanied by explosions, and a violent erup- tion of Veauvius after a long period of repose.	Journ. des Débats, 21 Avril; Ar- chives des Découv. 1835, p. 29 et suiv.; L'Institut, Nra. 102, 113 et 116.
— —	3. In the county of Szath- mar in Upper Hungary	Violent shocks .....	.....	Colla, Bibl. Ital. t. lxxviii.



1.	2.	3.	4.	5.	6.
1835, Apr. 15. 11 <sup>h</sup> 45 <sup>m</sup> A.M.	Borgotaro in Tuscany...	Two slight shocks ...			Colla.
— 18. 6 <sup>h</sup> 25 <sup>m</sup> P.M.	In the valley of Inter- lacken, Switzerland.	A very severe shock, lasting nearly a min. Followed, 5 minutes after, by a second, and at 9 <sup>h</sup> 45 <sup>m</sup> by a third and slighter one.		The new building of the château was shaken by three successive shocks, besides formidable vibratory motion. The earth was distinctly shaken as by a blow, and the bell sounded.	Ditto; Mérian.
— 20. 4 A.M.	Borgotaro in Tuscany...	Another very severe shock, undulatory, lasting 5 secs. At 6 <sup>h</sup> , two other vio- lent shocks, and at 2 P.M. two others, prolonged, and very severe.		The shocks at 2 P.M. were accompanied by deto- nations.	Colla.
— 21. 8 <sup>h</sup> 30 <sup>m</sup> P.M.	Kischinew in Bessa- bia, and at the same instant at Ismail.	At Kischinew a severe shock from N. to S., lasting 3 or 4 secs.		Followed by lightning and a very impetuous wind.	Ditto, Bibl. Ital. t. lxxviii.
— 25. 3 <sup>h</sup> 45 <sup>m</sup> A.M.	Borgotaro in Tuscany. Felt with the same violence at Pontre- moli, Compiano, and Bedonia, and slightly at Bardi.	Another very severe undulatory shock.		Accompanied by very intense noise. The inha- bitants fled from their houses.	Colla.
— May 10. About 10 <sup>h</sup> 30 <sup>m</sup> P.M.	Again at Borgotaro.....	Another slight shock.			Ditto.
— 19. 1 <sup>h</sup> 10 <sup>m</sup> A.M. at Trieste. Between 1 and 2 at Laybach.	Trieste, and at Laybach in Carinthia.	At Trieste an undula- tory shock from S. to N., lasting 4 secs. At Laybach a se- vere shock.			Ditto, Bibl. Ital. t. lxxviii; Garnier, Météorologie, p. 173.
— 23. Boyes near Cunco or Coni in Piedmont.		Two shocks .....			
— June 12. Rougemont, Chateau d'Oex, in the eastern		An earthquake .....		The first shock was of sufficient strength to throw down a great number of chimnies.	Mérian.

part of the Canton du Vaud. Less severely felt at Villeneuve and Montreux.	A very perceptible movement of the ground, in the di- rection S.W. to N.E. Another shock, not quite so strongly felt as the last.			Preceded by a loud explosion, which lasted two seconds.	Annual Register, 1835, p. 94; Journ. des Débats, 9 Juillet; Moniteur, 10 Juillet.
1835. June 16. 0 <sup>h</sup> 20 <sup>m</sup> A.M.	Ditto	Ditto, intermediate in intensity between the first and second.	An hour before, the sea to the south of Cape Vasilco ap- peared tinged of a reddish colour, like that of safflower, and diffused a strong acid odour (!).	Ditto, not quite so loud as the last	Ditto.
0 <sup>h</sup> 29 <sup>m</sup> A.M. (Same hour as on the 16th.)	Ditto	Ditto, intermediate in intensity between the first and second.		Ditto, intermediate between first and second. Ditto. The atmosphere was very clear and serene.	Ditto.
0 <sup>h</sup> 16 <sup>m</sup> P.M.	Veavuis	Some shocks		During the eruption of the volcano	Journ. des Débats, 22 Juin. Colla.
July 12. 10 A.M.	In the neighbourhood of Zante, in the island of same name.	A severe shock			
— 31.	Egisan in the canton of Zurich.	A tremor			Mérian.
A little before 10 P.M.	Borgotaro in Tuscany...	Another shock?		Subterranean noise, lasting several seconds. No Colla. shock is mentioned.	
Aug. 1. 9 <sup>h</sup> 45 <sup>m</sup> P.M.	Liverpool, Lancashire, Cheshire, Blackpool, and other parts of Lancashire.	The second and more violent shock was vibratory, and last- ed about 30 sec.		Accompanied by a noise like that produced by the dragging of heavy artillery over pavement. The motion felt as if the ground were rising and falling.	Annual Register, 1835, p. 128; D. Milne's Catalogue, loc. cit.
Midnight (of the 19th) and 3 <sup>h</sup> 30 <sup>m</sup> A.M.	Kaisarich in Cappadocia,	A terrible earthquake.		Preceded at Kaisarich by the appearance of a thick smoke on Mount Ardscheh, whence there issued flames, accompanied by dreadful noise, like the eruption of a volcano. During the whole period of the earthquake the shocks were accompanied by noise like thunder. More than 200 houses fell at Kaisarich, and 150 persons perished. All the villages to the	Journ. des Débats, 7 Nov.; Comptes Rendus de l'Acad. t. i. p. 252; Garnier, p. 175; Huot, Cours de Géol.; Gentleman's Magazine, N. S. vol. v. pt. i. p. 195.
— 23. 5 P.M.	and the surrounding country. (The Moni- teur of Sept. 21 men- tions an earthquake at Trebizond in the beginning of August, and says that 300	The shocks con- tinued six hours, during which time it seemed to an ob- server as if he were tossed upon the surface of a tem-			

1.	2.	3.	4.	5.	6.
	houses were destroyed by it at Kaisar. This no doubt refers to the event here recorded.)	pestuous sea. The shocks recurred, though with much less violence, up to the 1st Sept.		south of this place, for a circuit of more than 30 miles, suffered dreadfully, almost all the habitations being utterly destroyed, and many of the people losing their lives. Kumetri is said to have been swallowed up, and a lake formed in its place. The Gentleman's Magazine gives the date August 25.	
1835, Aug. 26. Singapore (?)		Lasted a few seconds.			Asiatic Journal, N. S. vol. xix. pt. 2. p. 128.
— 30. Constantinople		A slight shock.			Colla.
7 <sup>h</sup> 8 <sup>m</sup> A.M.					
Sept. 14. Niort in the departm.		A shock			Moniteur, 7 Oct.
	Deux-Sèvres, and St. Jean-d'Angely in the departm. Charente-Inférieure.				
— — — — —	Die, Saillans, and Valréas, in the departm. Drôme, and west of La Lauce.	A subterranean commotion.		Accompanied by noise. It is observed that the lines joining these places and those last mentioned (Niort and St. Jean-d'Angely), are very nearly parallel, but it seems improbable that the shock felt in both districts was the same, particularly as in each case it was only felt over a space of some myriamètres.	Ditto.
— — — — —	In the arrondissement of Yvetot, and at Bourg-Dun in the arrondissement of Dieppe, department Seine Inférieure. Felt over a space of but two myriamètres.	A slight shock, lasting not more than 5 or 6 secs.	Also felt by some sailors who were out fishing.	A dull noise was heard, and some articles of furniture were shaken about.	Garnier, Météorologie, p. 176.
Day not given. Between 6 and 7 A.M.					
— Oct. 12. In the middle of the night.	In Calabria Citra, and on the confines of the adjoining provinces. The centre of disturbance seems to have been at Castiglione in the commune of Cosenza.	Violent shocks. The first lasted 4 secs., and was followed by ten others the same night, and several more during the following days.		Castiglione was utterly destroyed and razed to the ground. Out of its 1000 inhabitants, 100 perished beneath the ruins, and many others were grievously injured. At Cosenza the buildings were seriously damaged, but no lives were lost. In other neighbouring districts there were 30 persons killed and as many wounded.	Journ. des Débats, 9 Déc.; Moniteur, 10 Déc.; Colla.

<p>particulars, tremors, and          rone. Also felt at          Louzer, Valcabrère,          Izaut, Anla, and the          whole neighbourhood.</p>	<p>... was quite, dis-          tulatory, and last-          ed nearly a minute.          The direction of          this movement was          E.S.E. to W.N.W.,          which is said to be          precisely the direc-          tion of the beds of          compact limestone          of the lower chalk          on which St. Ber-          trand is built, and          also the direction of          the whole chain of          the Pyrenees. An          hour after the first          shock a second was          felt at St. Bertrand.          A severe shock, the          most violent re-          membered at this          place. Direction =          W. to E. Lasted 4          or 5 seconds. Two          other shocks, but of          much less severity,          were felt, with an          interval of a quar-          ter of an hour.</p>	<p>... All the furniture in the houses was displaced ... Ditto.</p>	<p>... At Bagneres the inhabitants fled in alarm from          their houses. Some walls and ceilings were          cracked. The shocks were followed by a loud          noise like the rolling of thunder amongst the          gorges of the Pyrenees. Direction = W. to E.</p>
<p>28. Lux, near Baréges in the          same district.</p>	<p>Shocks, which are said          to have lasted sev-          eral minutes at Bag-          nères. They were          considerably in-          creased in violence          and duration in the          places nearest to          the Pyrenees.</p>		
<p>About 3<sup>h</sup> 45<sup>m</sup>          A.M.</p>	<p>Tarbes in the departm.          Hautes-Pyrénées, and          for several leagues          round.</p>		
<p>About 4<sup>h</sup> 30<sup>m</sup>          A.M.</p>			

1.	2.	3.	4.	5.	6.
1835, Oct. 29. St. Gall, Appenzell, and about 4 a.m. the neighbouring district, Switzerland. (At Bâle, at 3 <sup>h</sup> 47 <sup>m</sup> .)	Also felt at Bâle.	A violent shock.		Several bells were made to sound. A dull sound like the report of a cannon in the distance was heard. Luminous meteors were observed.	Colla; Mérian.
Nov. 1. In the Moluccas islands. 3 a.m.		A violent and destructive earthquake. In Amboyna the single shock on this day lasted 35 secs. It was the most violent, but other shocks were felt on the 4th.		Preceded for three weeks by a heavy sulphurous fog. A volcanic eruption at the same time at Gunung Api in the island of Banda. Buildings were ruined and many persons lost their lives.	Asiatic Journal, N. S. vol. xx. pt. 2. p. 173.
— 11. Concepcion in Chili ...		A severe earthquake.		The volcanos of Osorno and Corcovado, at the distance of 400 miles, were in violent action.	Trans. Geol. Soc. (London), 2nd series, vol. v. p. 610.
— 12. Castiglione and other parts of Calabria Citra.		Followed at intervals by ten other shocks.		This doubtless refers to the event recorded under Oct. 12; but which is the correct date?	Annual Register, 1835, p. 154.
— 24. At the Dardanelles ...		Severe shocks.			Colla.
— End of the month. During the night.	Pau in the department Basses-Pyrénées.	Some persons supposed they had remarked earthquake shocks.		Others said they had heard subterranean noises like loud explosions. After rather severe cold the weather suddenly changed, and a hot suffocating south wind arose.	Moniteur, 3 Déc.
— Dec. 17. Athens. In the morning.	Felt also simultaneously at Thebes.	At Athens two shocks, one of which was very violent.			Colla.
1836, Jan. 3. Mindanao, one of the Philippine isles.		Two undulatory shocks.		Several volcanos in Mindanao active at the time.	Asiatic Journal, N. S. vol. xx. pt. 2. p. 236.
— 11. 4 <sup>h</sup> 3 <sup>m</sup> a.m.	Rome and the environs.			An account written some time after says that since this earthquake the atmosphere had been extremely warm, the evenings resembling those of spring. A more violent shock was expected.	Garnier, p. 178; Colla.
— 24. Chandernagore and Sook Saugor, Hindostan.					Asiatic Journal, N. S. vol. xx. pt. 2. p. 187.
— 28. 9 p.m.	At sea, in 0° 40' S. lat. and 22° 30' W. long. (from Paris).		On board the ship 'Le Philanthrope' of Bordeaux, a shock		Dansey in the Comptes Rendus de l'Acad. t. vi. p. 514.

1836. Feb. 9. 5 P.M.	Different places in the county of Simegh in Hungary.	A very severe shock.	the vessel tremble for three minutes, as if she had struck upon a bank. Also felt on board an American ship, ten miles to the west of the 'Philanthrope,' at the same time. The next day the waters of a lake were still very much agitated, and rose to an extraordinary height.	Preceded by terrible noise, and extraordinary disturbances in the atmosphere. At Zallia-Gyorok the ruins were numerous. In some places flames issued from the ground.	Colla, Bibl. Ital. t. lxxviii.
— 23. 0 <sup>h</sup> 33 <sup>m</sup> P.M.	Parma and the neighbourhood.	A very slight shock, from E. to W., lasting 2 secs.			Colla.
— 24.	In the neighbourhood of Sala in the duchy of Parma.	Another very slight shock.			Ditto.
— 26. — March. Beginning of the month.	Ditto Kaisarich in Asia Minor (Cappadocia).	Ditto Severe undulatory shocks.			Ditto. Ditto.
— 26. 3 <sup>h</sup> 50 <sup>m</sup> A.M. — April 4. In the morning.	Fribourg in Switzerland. In Shropshire	Three very severe shocks. A shock			Ditto; Mérian. Communication of M. Pléninger of Stuttgart to M. Perrey.
— 24. At night.	District of Rossano in Calabria Citra, especially the communes of Rossano and Crociosa. Also felt at Cinosia in the province of Otranto, Craco in the Basilicata, and at Naples.	A terribly destructive earthquake. At Naples two shocks were felt during the night.	The sea retired forty paces at one part of the shore, and advanced to an equal extent at another. Volcanic substances and fish of species unknown to the fishermen were thrown upon the beach.	In Rossano, an instant after the shock, all the houses were seen either thrown down or crumbling into ruins; and in Crociosa not a single house was left standing. Long and deep fissures opened in the earth. An igneous meteor was seen, having the appearance of great beams on fire. At Cinosia and Craco some buildings were thrown down. The next day Vesuvius sent forth thick smoke.	Garnier, <i>Météorologie</i> , p. 178; Colla.

1.	2.	3.	4.	5.	6.
1836, May 9, Spalatro in Dalmatia, 2 <sup>h</sup> 44 <sup>m</sup> P.M.	and the neighbourhood.	A severe shock. The motion was at first undulatory, from S.E. to N.W., but then became vertical.		Preceded by subterranean bellowing noise. At the time of the most severe shock a violent S.E. wind blew.	Colla.
13. About 5 A.M. At Parthenay, 5 <sup>h</sup> 3 <sup>m</sup> A.M.	Angers, Nantes, and Parthenay, in the west of France.	At Angers several shocks. At Nantes a slight vibration. At Parthenay two shocks, more violent than at the other places, from N.W. to S.E., succeeding each other with but little interval. Followed at 10 <sup>h</sup> 30 <sup>m</sup> P.M. by another shock in the same direction, but slighter.		Preceded at Angers by a dull sound. In many houses the windows and articles of furniture were violently agitated. At Parthenay the shocks were accompanied by subterranean noise like distant thunder. The second caused a general and violent tremor. Persons who were up felt themselves raised from the ground; others who were in bed and asleep were awakened by a commotion like that produced by an electrical machine (an electric shock?), and felt themselves ill for a considerable time.	Journ. des Débats, 17 et 19 Mai; Bull. de la Soc. Géol. t. vii. p. 260; Bibl. Ital.
14. June 11 to 18.	La Rochelle. In the province of Trevisa. The shock of the morning of the 12th was felt at many places in Upper Italy.	A slight oscillatory motion. Very severe shocks. The first, on the 11th at 11 P.M., was followed by a more violent one at 3 <sup>h</sup> 35 <sup>m</sup> A.M. the next morning, and by sixteen others of less severity in the course of the week. The shock of the morning of the 12th was particularly distinct at Venice, where it seemed to pass from E. to W.		Ditto. In the district of Ascoli houses were thrown down and others much injured. There had been a shock at Venice about the beginning of the month.	Moniteur, 24 Juin et 26 Sept.; Garnier, p. 180; Colla.

1836. June 12	Parma	Slight shocks	.....	.....	Ditto.
— 13.	— 15. Frascati in the Romagna.	Two slight shocks	.....	.....	Ditto.
1 P.M.	— 21. Venice	An undulatory shock from N.E. to S.W., lasting 4 or 5 secs.	.....	Accompanied by subterranean noise.	Ditto.
4 A.M.	— 22. Different places in Central America.	.....	.....	.....	.....
— 23.	— 29. Laybach in Carinthia	An undulatory shock from E. to W.	.....	Accompanying the eruption of a volcano to the east of Omoa. Perhaps this event occurred, not in June, but on the 22nd and 23rd of May.	Journ. des Débats, 23 Juillet; Communication of M. Colla to M. Perrey. Colla, Bibl. Ital. t. lxxviii.
2 <sup>h</sup> 28 <sup>m</sup> A.M.	— July 7. Soleure and the neighbourhood.	A severe shock from S. to N.	.....	.....	Ditto; Mérian; Studer.
6 <sup>h</sup> 15 <sup>m</sup> P.M.	— 15. Parma	A very slight shock from E. to W.	.....	.....	Journ. des Débats, 4 et 6 Août; Moniteur, 6 Août; Garnier, p. 180; Colla.
0 <sup>h</sup> 35 <sup>m</sup> P.M.	— Venice	Two undulatory shocks from N. to S., the first lasting 3 seconds and the second 4.	.....	.....	Ditto.
1 P.M.	— 20. Bassano and the neighbouring places, government of Venice, in Upper Italy, the Tyrol, as at Innsbruck, and at Munich.	At Bassano and the neighbouring places there were three shocks, of which the most severe occurred at noon.	.....	Along the mountain from Borso to Passagno some houses were thrown down, and some persons lost their lives, and at Passagno many houses were injured. At Brixen it seemed as if some one were marching with heavy tread up and down in the room overhead, and a noise was heard like distant thunder. The next day an icy storm, following upon suffocating heat.	Ditto.
— Aug. 8.	Smyrna	Five shocks, the first of which was from N. to S., and very severe.	.....	At 10 P.M. a luminous meteor had been seen, which sent forth numerous sparks.	Colla.
Midnight (of the 7th?), and 3 A.M.	— 11. Messina	A very slight shock	.....	.....	Ditto.
5 <sup>h</sup> 45 <sup>m</sup> A.M.	— Sept. 16. Nîmes in the department du Gard, and more distinctly at Vauvert and some neighbouring	A general tremulous motion, lasting 2 or 3 secs.	.....	Accompanied by a loud explosion. Walls and moveable objects distinctly oscillated.	Moniteur, 24 et 25 Sept.; Bibl. Ital.



1.	2.	3.	4.	5.	6.
1836, Sept. 26. About 7 <sup>h</sup> 45 <sup>m</sup> P.M. at Modena. About 8 P.M. at Venice.	ing villages. Also felt at Beaune, but not at all at Montpellier. Modena, and Venice and the environs.	At Modena a slight undulatory shock, as also at Venice, where the motion was from E. to W., and lasted some seconds.			Colla.
— 27. Towards evening. — Oct. 5. A little before 5 P.M.	Oran on the north coast of Africa.	Two shocks .....		Objects placed upon articles of furniture were thrown down.	Moniteur, 18 Oct.
— Night between 18 and 19. 10 A.M. — Nov. 5. 7 A.M.	Zara in Dalmatia..... Sarnen in the canton of Unterwalden, Swit- zerland. Blytheswood (in Ren- frewshire?). Bale and in the north- west part of Switzer- land, on the one side at Lörrach, and on the other in the Lei- mental, at Arles- heim, Schauenbourg, and very slightly at Bissham, Soleure, Sundban, and Liestal.	A slight undulatory shock. Severe shocks .....			Colla. Ditto, Bibl. Ital. t. lxxviii; Mérian; D. Milne's Catalogue, <i>loc. cit.</i> D. Milne's Catalogue, <i>loc. cit.</i> The earthquake at Altkirk about the end of the year mentioned in the Journal des Débats, 30 Janv. 1837, probably refers to the event of this day.
— 13. At night.	Various places in Croa- tia.	Numerous and vio- lent shocks, which continued, though with less intensity, up to the 16th. More shocks .....			Colla, Bibl. Ital. t. lxxviii.
— 18. 6 <sup>h</sup> 30 <sup>m</sup> to 10 A.M.	Ditto .....	Ditto .....			Ditto.

1836. Nov. 20. 8 A.M.	Naples .....	A violent shock .....	.....	The following night a loud noise heard from the interior of Vesuvius. Some peals of thunder also heard.	Journ. des Débats, 8 Déc.; Moniteur, 9 Déc. Colla, Bibl. Ital. t. lxxvi.
— 21.	Grenada in Spain and the surrounding localities.	Severe shocks .....	.....	.....	Ditto, t. lxxviii.
— 22.	Various places in Croatia.	More shocks .....	.....	.....	.....
— Night between 28 and 29 (O.S. or N.S.?) About midnight.	Slato or Slaskow in the Oural. Also at the village of Turgojack, and in the neighbourhood of the mines of Kischtimski.	A severe shock from N.E. to S.W., lasting 3 sec.	.....	.....	.....
— Dec. 11.	Slatoust, Kychtinsk, and Turdojack, in the southern part of the Oural.	.....	.....	.....	.....
— 23.	Egilsau in the canton of Zurich, Switzerland.	A vibration .....	.....	.....	.....
9 <sup>h</sup> 30 <sup>m</sup> A.M. 1837. Jan. 1. 9 <sup>h</sup> 40 <sup>m</sup> A.M.	Ancona .....	A severe undulatory shock from E. to W.	.....	.....	.....
— A little after sunset.	In Syria, extending over a district of 500 miles in length by ninety in breadth. Less severely felt in the north. The centre of disturbance was supposed to be the subterranean volcano which throws forth the bitumen into the Dead Sea (?).	A most disastrous earthquake. The violent shocks of this day were followed by others up to the middle of the month. At Tripolis but a single violent shock was felt.	During the earthquake the waters of Lake Tiberias were in a state of violent disturbance.	From Beyrout and Damascus to Saphit, the devastation of the country continually increased. In the latter place not one stone was left upon another, and out of the population of 4000, 3500 persons perished beneath the ruins. Tiberias was ruined, and Jaffa, St. Jean d'Acre, Tiberias, &c. suffered greatly. Whole villages are said to have been swallowed up. Those of Labic and Rani were completely destroyed, whilst Kefar-Renna (the ancient Cana in Galilee), situated between the two and near Rani, had not a single house thrown down, and the shock was very little felt there. Deep fissures were formed in solid rocks, and at Tabarich new hot springs made their appearance. At Nazareth the earth opened for 112 feet in length by 1½ foot in breadth, and then closed within 4ths of this breadth again.	Journ. des Débats, 24 Fév., 17 Mai, et 1 Juin; Moniteur, 24 Fév. et 22 Mai; Garnier, Proceedings Geol. Soc. (Lond.) vol. ii. p. 658; Annual Register, 1837, p. 15; Asiatic Journal, N. S. vol. xxiv. pt. 2. p. 175.

1.	2.	3.	4.	5.	6.
1837. Jan. Night between 10 and 11. About mid- night.	Poitiers in France .....	Two shocks, one of which was very se- vere.			Colla, Ann. Astr. 1839, p. 109.
About 2, and 4 or 5 A.M.	Geneva.....	Two severe shocks ...			Ditto; Journ. des Débats, 30 Janv. et 1 Fév.; Moniteur, 2 Fév.; L'Institut, Nr. 218. 1837; Garnier. Ditto; Bull. de l'Acad. Roy. de Bruxelles, t. iv. p. 74.
About 2 A.M. At Altkirk, at 1 <sup>h</sup> 45 <sup>m</sup> and some mins. after 2 <sup>h</sup> . At Stuttgart & Oberndorf, at 1 <sup>h</sup> 54 <sup>m</sup> , & 2 <sup>h</sup> 11 <sup>m</sup> . At Sion & Brieg, at 1 <sup>h</sup> 58 <sup>m</sup> . At Constance, 2 A.M. At Berne, about 1 <sup>h</sup> 47 <sup>m</sup> , and 2 <sup>h</sup> 7 <sup>m</sup> . At Besançon, 2 <sup>h</sup> 32 <sup>m</sup> .	Altkirk, Besançon, Bâle, Berne, Soleure, Con- stance, Sion, Burdorf, Stuttgart, Oberndorf, Zurich, Dorneckdorf in the canton of So- leure, Geneva, Brieg, and other places in the duchy of Baden, in Wurtemberg, Al- sace, Switzerland, Lombardy, and Pied- mont.	Severeshocks. At Alt- kirk there were two, the first lasting eight seconds, the second a shorter time. At Stuttgart and O- berndorf there were also two shocks; direction = E. to W. At Sion and Brieg there were likewise two; at Burdorf three, in the di- rection S.S.W. to N.N.E. At Con- stance a violent shock, followed by another half an hour after. At Zu- rich the shocks were violent but of short duration. At Berne, three shocks, the two latter of which were less distinct than the first, and occurred at 2 <sup>h</sup> 7 <sup>m</sup> . At Bâle and in the neighbouring com- munes two or per- haps three move-		At Altkirk the first shock was preceded by a noise like the fall of a mass of stones. The air was calm and clear. At Sion and Brieg the attendant noise seemed to pass from S. to N. The hygrometer at Sion, which had been so steadily fixed between 90° and 100° for two months that the instrument was supposed to be out of order, suddenly rose 15°. At Bâle persons who were asleep were awakened, and at Soleure some cages of birds were thrown down. At Besançon the first shock threw loose objects from S. to N., and then back again from N. to S.	

1837. Jan. 25. Zurich .....	ments were felt. At Dorneckdorf there were two shocks, N. to S. At Brieg the shocks and attendant noise recurred for several days. At Beaucou, two shocks with an interval of half a second. The first shock was from S. to N. and then N. to S., the second was from E. to W. In Lombardy and Piedmont the motion was from N. to S.			Mérian.
3 <sup>h</sup> 6 <sup>m</sup> A.M. ——— 28. 11 <sup>h</sup> 58 <sup>m</sup> P.M. ———	In the canton of Soleure. Felt more strongly at Seeburg and Steinhof than at Soleure.	Very distinct shocks.		Ditto; Colla, <i>loc. cit.</i>
———— 29. ———	Vizille in the departm. Isère.	A strong subterranean movement.		
———— Night between 30 and 31. ———	Slightly felt at Brieg in the Valais, but more violently at some leagues distance, nearer to the sources of the Rhône.	Several shocks	Preceded by a violent explosion, like the simultaneous discharge of several pieces of artillery.	Colla, <i>loc. cit.</i> Bull. de l'Acad. Roy. de Bruxelles, t. iv. p. 75.
———— Feb. 14. ———	Soleure.	Slight shocks		Mérian.
———— 16. ———	Ditto	Ditto		Ditto.
———— 18. ———	Ditto	Ditto		Ditto.
11 <sup>h</sup> 54 <sup>m</sup> P.M. ———				
7 <sup>h</sup> 30 <sup>m</sup> A.M. ———	Bâle	A very slight shock	During a storm. Considered very doubtful by Mérian.	Colla, <i>loc. cit.</i>
———— 20. ———	Soleure	Slight shocks		Mérian.
Midnight. ———				

1.	2.	3.	4.	5.	6.
1837. Feb. 25. About 5 <sup>h</sup> 15 <sup>m</sup> A.M.	Ghent .....	A rather severe oscillatory shock, from S.E. to N.W., lasting two or three seconds. More severe than that which occurred here eight years before.		During stormy weather. Wind S.S.W. Thermometer $-4^{\circ}5$ R.	Garnier, Météorologie, p. 183.
— — — 29.	In the southern part of the Oural, at Slavoust, Kychinsk, and Turdojask near Minsk.				v. Humboldt, Asie Centrale, t. ii. p. 119.
— March 3. Two hours and some minutes after midnight (of the 2nd?).	Zara in Dalmatia .....	A severe shock, from S.W. to N.E., lasting two seconds.		Preceded by a dull noise .....	Colla.
— 8 <sup>h</sup> 45 <sup>m</sup> P.M.	Perugia in Italy .....	A very distinct shock from N. to S.		The magnetic needle had been disturbed several days before.	Ditto.
— Beginning of the night.	Messina .....	A severe shock, from E. to W.			Ditto.
— 15. 4 <sup>h</sup> 45 <sup>m</sup> P.M. (The Bull. de l'Acad. Roy. de Bruxelles, <i>loc. cit.</i> gives the date March 14, 4 <sup>h</sup> 43 <sup>m</sup> P.M.)	Vienna. Also felt at Brunn, Gratz, Talbin, Linz, and other places in Austria.	Two shocks, the first at the hour mentioned, the second a few seconds afterwards. From N.W. to S.E. Each shock lasted about two or three seconds. There had been two others at 4 <sup>h</sup> 3 <sup>m</sup> (?).		Bells rang .....	Bull. de l'Acad. Roy. de Bruxelles, t. iv. p. 127; Moniteur, 27 Mars; Colla, Ann. Astr. 1839, p. 110.
— 18. to April 1, especially on the 20th.	In Hydra and other islands of the Grecian Archipelago; the centre of disturbance apparently at Methone. Also felt at the same time in the interior of Greece.	Disastrous shocks, which in Hydra recurred several times daily.		Some houses in Hydra were thrown down and others injured. In the islands of Spezia, Paros, and Santorin, damage was also done.	Journ. des Débats, 25 Avril; Colla; Garnier; Berghaus, Länder-und Völker-Kunde, B. ii. S. 709.

1837. Mar. 28. 8 <sup>h</sup> 30 <sup>m</sup> P.M.	In the islands of Lagosta and Curzola, Dalmatia.	A very distinct shock, from E. to W.			Preceded by a dull noise. In Curzola a luminous meteor had been seen at 6 <sup>h</sup> 15 <sup>m</sup> , which was like a train of fire, and vanished in the east.	[Colla.]
— April 11. 5 <sup>h</sup> 30 <sup>m</sup> P.M.	Ugiano and other places in Upper Italy. Ex- tended from Genoa to Florence. The centre of disturbance seems to have been the Piz- zo-di-Ucello, one of the highest peaks of the Apuan Alps.	The first shock at the hour mentioned was followed by others until the next morning, in which time thirty-two were counted. Ac- cording to some ac- counts the motion was undulatory, ac- cording to others vibratory and per- ceptibly verticose.			Ditto; Journ. des Débats, 27 Avril; Giornale Agrario Toscano, Nr. 43.	
— — — 12.	Hartford in Connecticut.	Very slight				Silliman's Journal, vol. xxiii. p. 339.
— May 27. About 6 P.M.	Coblentz . . . . .	A slight shock . . . . .				Garnier, <i>Météorologie</i> , p. 183.
— — — 28. 6 <sup>h</sup> 35 <sup>m</sup> A.M.	Island of Martinique . . . . .	A very strong shock . . . . .				Comptes Rendus de l'Acad. t. v. p. 194.
In the even- ing.	In the environs of Rome, prin- cipally in the district of the extinct volcano of Monte Lavinio.	Several very distinct shocks.			The volcanic phenomena previously observed in Guadaloupe did not extend to Martinique.	Journ. des Débats, 13 Juin; Garnier, p. 185; Colla.
— — — 29.	Albano, Marino, Fras- cati, &c., in the neigh- bourhood of Rome.	Three severe shocks . . . . .				Ditto.
Before sun- rise.	Innsbruck in the Tyrol.	Two severe shocks . . . . .				Garnier, <i>Météorologie</i> , p. 186.
5 <sup>h</sup> 15 <sup>m</sup> A.M.	Some places in the de- partm. du Cher.	Severe shocks . . . . .				Colla, <i>loc. cit.</i>
— June 1.	In the neighbourhood of Monte Lavinio (Lo- pine?), near Rome.	Several shocks . . . . .				Journ. des Débats, 13 Juin; Garnier, p. 185; Colla.
(Q. 2.) 30 A.M.	Petropawlowski Kamtschatka.	In A slight earthquake . . . . .			The air calm and sky clear. Thermometer, 18°·3 R. Barometer, 29·95 inches (English or French?).	Dupré-Thouvenin, <i>Voyage de Vésuvius</i> , part. Phys. t. iv. p. 444.

1.	2.	3.	4.	5.	6.
1837, June 21. Some minutes before 11 A.M.	Bleibourg, Guttenstein, and Schwarzenbach, in Illyria. Extended as far Schönstein in Styria.	A rather severe earth- quake, lasting some seconds.	.....	Preceded by a noise like the rolling of thunder...	Garnier, p. 186; Colla, Ann. Astr. 1839, p. 111.
— July 26.	Island of Martinique ...	Several shocks.....	Accompanied by a terrible "raz de ma- rée."	During a dreadful hurricane .....	Journ. des Débats, 15 Sept.
— Aug. 2.	Island of St. Thomas ...	.....	.....	Accompanying the tremendous hurricane which devastated the West Indies on this day. The account seems very doubtful.	Moniteur, 17 Sept.
— At night.	Sydney and Newcastle in New South Wales.	.....	.....	Accompanied by a noise like the distant discharge of artillery.	Asiatic Journal, N.S. vol. xxv. pt. 2. p. 29.
— In the morn- ing.	3. In the island of Zante. Slightly felt at the same time in Ceph- lonia and various places in the Morea.	Some severe shocks...	.....	Some damage done.....	Colla.
— 4 <sup>h</sup> 30 <sup>m</sup> P.M. at Acapulco.	9. Acapulco, Morelia, and Mexico.	At Acapulco the vi- bratory motion is said to have lasted a <i>mon/h</i> almost un- interruptedly, the most severe shocks occurring nearly re- gularly at intervals of thirty or thirty- two hours. At Mex- ico the first shock only was felt. It was accompanied by slight undulatory motion. At More- lia there were two shocks with an in- terval of two se- conds, and accom- panied by oscilla- tions from S. to N.	.....	The buildings of Acapulco were greatly injured. At Morelia a violent tempest from the N.N.E. began at 4 <sup>h</sup> 30 <sup>m</sup> , accompanied by thunder and lightning. In the evening a great number of shooting stars were observed.	Dupetit-Thouars, Voyage de la Vé- nus, t. ii. p. 214; Colla, Giorn. Astron. 1839, p. 111; Bull. de l'Acad. Roy. de Bruxelles, t. viii. pt. 2. p. 438.

1837. Aug. 21. 9 <sup>h</sup> 15 <sup>m</sup> A.M.	Piacenza in Italy	About the end of the month several shocks at Tortola.	.....	.....	Colla.
— 29.	Island of St. Vincent in the West Indies.	A slight undulatory shock from E.N.E. to W.S.W.	.....	.....	Journ. des Débats, 23 Déc.
— Sept. 2 to 7.	Alvaly, and on the coast of the Gulf of Adramiti, Anatolia.	Slight but continual shocks.	.....	.....	Moniteur, 30 Sept.
— 4. 3 <sup>h</sup> 30 <sup>m</sup> A.M.	Milan	A shock, from E. to W. lasting two seconds.	.....	.....	Colla.
— 10 A.M.	Ario in Mexico. The origin apparently in the volcano of Jorullo.	A gentle oscillation from S. to N.	.....	Some hours after, a violent storm, the summit of Jorullo being enveloped in a grey cloud, which afterwards cleared away and left a serene sky. Many shooting stars observed at night.	Bull. de l'Acad. Roy. de Bruxelles, t. viii. pt. 2. p. 438.
—	Island of Barbadoes	Several shocks, one of which lasted twenty seconds.	.....	Some damage done by the shock of twenty seconds.	Journ. des Débats, 22 Déc.
— Night between 6 and 7. (N.S.)	Petropawlowaki Kamtschatka.	In A slight shock.	Not felt on board the 'Vénus.'	The horizontal magnetic needle on shore presented no marked disturbance. The shock seems, like many others, to have been felt only on one of the two hills of the town. It is said that earthquakes and volcanic eruptions are common in Kamtschatka, but that storms and the aurora borealis are rare, notwithstanding the high latitude.	Dupetit-Thouars, Voyage de la Vénus, t. ii. p. 25. et part. Phys. t. v. p. 173 et suiv.
— 19. 3 <sup>h</sup> 45 <sup>m</sup> A.M.	Eglisau in the canton of Zurich.	A very severe shock, consisting of a sudden sharp jerk. Half an hour after, another slight shock.	.....	The second shock was accompanied by a dull rumbling noise.	Colla.
— 3 A.M.	Lasaya in Van Diemen's Land. Extended also to Maya on the coast of New Holland. (Where are these places situated?)	Violent and disastrous earthquake, which continued until dawn.	The sea made inroads upon the shore, and a new island was formed (owing to the earthquake or the storm?).	On the evening of the 21st terrible explosions were heard at Lasaya, and long luminous streaks of bright red were seen on the horizon; the whole sky then became of the same colour. During the earthquake the surface of the ground was in motion like that of the waves	M. Perrey's Memoir on Earthquakes in the basin of the Rhine, p. 94.



1.	2.	3.	4.	5.	6.
1837, Sept. 22. Noon.	Agram in Servia. Felt in the neighbourhood and in the mountains.	A violent shock from N. to S.		of the sea, while every five minutes the explosions became terrible. The atmosphere was heavy, and was lit up by flashes of lightning. Lasaya and Maya were thrown down and filled with corpses. A terrible tempest at the same time.	Journ. des Débats, 9 Oct.; Moniteur, 10 Oct.; Colla, Ann. 1839; p. 112.
— End of the month.	Penang and Acheen in the East Indies.	The shocks lasted for seven days.		Accompanied by subterranean noise like thunder. Walls were cracked. Thermometer in the shade +13° Reaum. Barometer, 28' 4" 8" (Viennese).	Journ. des Débats, 9 Oct.; Moniteur, 10 Oct.; Colla, Ann. 1839; p. 112.
— Oct. 3.	Vera Cruz	Several shocks		Volcanic eruptions took place in the neighbourhood of Acheen.	Asiatic Journal, N. S. vol. xxv. pt. 2. p. 232.
— 5 A.M.	4. Eglisau in the canton of Zurich.	A severe shock		Numerous shooting stars observed about this time at Guadalajarra, 237 leagues from the shore of the Atlantic.	Bull. de l'Acad. Roy. de Bruxelles, t. viii. pt. 2. p. 439.
— Afternoon.	6. Agram (in Croatia?)	Severe shocks		Accompanied by explosions which recurred at intervals of half an hour. Low bellowing noises had been heard for several days. Many houses thrown down.	Journ. des Débats, 8 Nov.; Moniteur, 9 Nov.; Colla, Ann. 1839, p. 112.
— 11. 7 <sup>h</sup> 30 <sup>m</sup> P.M.	Tilly - la - Campagne, Bourguibus, and Solins, in the departm. Calvados.	Violent shock		Accompanied by loud explosions	Journ. des Débats, 18 Oct.; Colla.
— 18. About 4 P.M.	Acapulco in Mexico. Felt also with considerable force at Mexico.	A violent earthquake, vibratory, lasting more than a minute in all its force. Up to 9 P.M., 130 shocks were counted. The shock of 4 P.M. lasted more than 2½ minutes at Mexico.			Dupetit-Thouars, Voyage de la Vé-nus, t. ii. p. 214; Moniteur, 15 Janv. 1838; Comptes Rendus, t. vi. p. 180.
— 19. 0 <sup>h</sup> 30 <sup>m</sup> A.M.	Ditto	Another shock of extreme violence, followed in an hour by another still more		Everyone was roused by the second shock, which produced extensive ruins. Loud subterranean bellowings were heard during the whole night, and continued during the day.	Ditto.

1837. Oct. 19. 10 P.M.	Ditto. The shock at midnight was very severe at Mexico, but not of long duration.	terrible than the former, and by slighter ones throughout the day. Two very severe shocks, followed by a third about midnight. The earth continued to tremble at intervals up to the 21st.	.....	Accompanied by ringing noises. The third shock threw the whole town into alarm.	Ditto.
— 2 P.M.	20. Listerd in Cornwall, and the country in the vicinity, both in Devonshire and Cornwall.	.....	.....	Accompanied by a sound like the rattling of a cart.	Trans. Roy. Geol. Soc. of Cornwall, vol. v. p. 142 (note), quoting the Cornwall Royal Gazette Newspaper of 27th Oct. and 3rd of November 1837.
— 2 A.M.	21. Acapulco .....	Another shock, rather severe; the earth then trembling until the next day at 10 A.M.	.....	.....	Authorities for Oct. 18.
— 10 A.M.	22. Ditto .....	Another severe shock. After this the earth was less disturbed; the shocks recurred periodically at 10 P.M., midnight, 6 A.M., and 4 P.M., for twenty days without ceasing. All the oscillatory movements were from W. to E. up to the 12th of November, after which time they recurred with more force at the same times as before, but in the opposite direction, or from E. to W. In	No perceptible elevation or depression of the waters of the sea was produced by any of these shocks.	.....	Ditto.

1.	2.	3.	4.	5.	6.
1837. Oct. 27. Camelford in Cornwall.		December the movements were again from W. to E., and thence up to January 1838 they daily diminished in intensity and frequency.			
— 30. Some minutes before 11 p.m.	Mulhouse and Breisach in the departm. Haut-Rhin.	A rather severe shock from E. to W.			
— 31. 0 <sup>h</sup> 58 <sup>m</sup> A.M.	At Murcia in Spain	A violent shock from N. to S., lasting 8 or 10 seconds.		Accompanied by dull noise. Is this a different earthquake from that of the 20th? The wind, which was from the south, and already very violent, changed to a tempest immediately after the shock.	Colla, Giorn. Astron. 1839, p. 112. Journ. des Débats, 11 Nov.; Colla; Mérian.
— 2 to 9 A.M.	Torreveja in the same district.	Shocks comparable in violence to those of March 1829. During the period mentioned 400 were felt, without any interval longer than a few minutes between each.		The atmosphere was suffocatingly hot and close. Buildings of the greatest solidity were violently shaken.	Journ. des Débats, 17 Nov.; Moniteur, 18 Nov. Ditto.
— Nov. Night between 2 & 3.	Carlsruhe.	A slight shock.			Mérian.
— 7.	In Chili	A violent earthquake.	Extraordinary movements of the ocean were observed in the Pacific. A whale-ship within sight of land in 43° 38' S. was violently shaken and lost her masts.	Valdivia was ruined. The captain of the whaler mentioned in Col. 4, found in a spot near the island of Lemus (Chonos Archipelago), where he had anchored two years before, that the bottom of the sea had been permanently raised more than 8 feet. The whole coast was strewn with uprooted trees.	Comptes Rendus de l'Acad. Oct. 1838, p. 706.
— 12. In the evening.	Lucerne	A severe shock		During the night of the 12th and 13th a beautiful aurora borealis was observed at different places in Europe.	Colla, Giorn. Astron. 1839.

1854.	1837. Nov. 22. 11 <sup>h</sup> 58 <sup>m</sup> P.M.	Guadalajara in Mexico. Also felt, a quarter of an hour later, at Mexico.	Three shocks, from W. to E., very violent.	.....	The origin was supposed to be in Cebo Rujo, a volcano to the west of Guadalajara.	Bull. de l'Acad. Roy. de Bruxelles, t. viii. pt. 2. p. 439.
—	— 24.	Cannelford in Cornwall.	.....	.....	The account of October 27 probably refers only to this event.	D. Milne's Catalogue, loc. cit.
—	8 <sup>h</sup> 30 <sup>m</sup> P.M.	Island of Martinique	A severe shock	.....	The temperature was high; it had been cool for several days before.	Comptes Rendus de l'Acad. t. vi. p. 302.
—	Dec. 8. 11 <sup>h</sup> 15 <sup>m</sup> P.M.	Stamford in Lincolnshire, and the country for twenty miles round.	Ditto	.....	Accompanied by a noise like that of carriages rolling over pavement.	Journ. des D�bats, 23 D�c. Colla, loc. cit.
—	3 <sup>h</sup> 7 <sup>m</sup> A.M.	11. Chalabre and St. Colombe in the depart. Aude. A slight shock was also felt at several places in the Arri�ge and Pyr�n�es Orientales.	A shock of thirty seconds' duration.	.....	Accompanied by loud noise	Colla, Ann. Astr. 1840.
—	1838. Jan. 5. 7 <sup>h</sup> 15 <sup>m</sup> and 7 <sup>h</sup> 30 <sup>m</sup> A.M.	Belley in the depart. Ain.	Two pretty distinct shocks, each lasting a second.	.....	Some persons asserted that they had seen flames issue from the earth.	.....
—	— to 14.	8 Spoleto and the neighborhood, States of the Church.	Very violent shocks.	.....	During this period the declination needle was carefully observed, but showed no symptom of disturbance in consequence of the earthquake shocks.	Comptes Rendus de l'Acad. t. ix. p. 330.
—	— to 23.	8 Acapulco in Mexico	During this period (while the Venus was in the port of Acapulco) thirty-four very slight shocks were felt, and one of somewhat greater severity.	.....	The next day a rent was remarked in the fields of more than half a mile in length, which was supposed to have been caused by the earthquake. Milne, in his Catalogue of British Earthquakes, gives the date January 21 for this one.	Ditto, t. vi. p. 900. Journ. des D�bats, 25 Janv.; Colla, Ann. Astr. 1840, p. 106.
—	— 7 A.M.	11. Bucharest	An earthquake	.....	.....	.....
—	— 7 A.M.	14. Tynehead in Northumberland.	A shock of sufficient force to throw down articles of furniture.	.....	.....	.....

1838. Jan. 24.	Pouilly, Toisy, and Mont-St.-Jean, in the departm. Côte-d'Or.	undulatory and of longer duration. A slight shock.			Journ. des Débats, 16 Fév.; Colla, Ann. Astr. 1840.
— 24 & 25.	Ismaïl, Bender, Reni, &c. in Besarabia.	More shocks			Pfenzinger, Jahresbericht über die Witterungs-Verhältnisse in Würtemberg.
— Night between 24 & 25.	Odesa	Slight shocks		It was remarked that the barometer, which had been in motion for several days, was much more agitated during these shocks.	Authorities for Jan. 23.
— 4 A.M.	Bucharest and Jassy	Another shock, instantaneous and very alight. Shocks were frequent during the last few days in Austrian Galicia, Transylvania, Hungary, Moldavia, Albania, Wallachia, and Besarabia.			Ditto.
— Feb. 2. At night.	In the valley of Pastusie, Sardinia.	Great subterranean commotion.		Accompanied by an explosion which threw everything, minerals and vegetables, to a distance. Part of the ground disappeared in fissures. Bells sounded of themselves. Perhaps not an earthquake proper at all.	Journ. des Débats, 31 Mars.
— 4 <sup>h</sup> 55 <sup>m</sup> A.M.	Cronstadt in Transylvania, and the places near.	Some very alight shocks.		During the inundation of the Danube at the end of the winter (some persons said) an earthquake occurred at Peath. Journ. des Débats, 31 Mars; Moniteur, 2 Avril.	Colla, Ann. Astr. 1840, p. 106, 107.
— 8 <sup>h</sup> 30 <sup>m</sup> A.M.	Foligno and the neighbourhood, States of the Church.	A severe shock, followed by several slighter ones in the course of the day.			Colla.

1.	2.	3.	4.	5.	6.
1838. Jan. 15. About 5 <sup>h</sup> 30 <sup>m</sup> p.m.	Gibraltar .....	Several slight shocks, in the direction of the walls of the fortress (!). At 10 <sup>h</sup> 20 <sup>m</sup> , a prolonged and very distinct shock, and at 11 <sup>h</sup> 15 <sup>m</sup> , a very slight one.			Colla, Giorn. Astron. 1840, p. 106.
— — — 21.	Island of Martinique ...	A slight shock.			Communication of M. Colla to M. Perrey.
— — — 22.	Tusla in Russia (Bosnia?)	A violent vibratory shock.			Pleninger, Jahrsbericht über die Witterungs-Verhältnisse in Würtemberg.
— — — 23.	In Transylvania, and parts of Turkey and Russia. The motion does not seem to have extended to the Asiatic side of the Bosphorus.	At Cronstadt and in Transylvania the shocks lasted a minute and thirteen seconds. At Odessa and in Russia they were very violent. At Constantinople there were two shocks, the first vertical, the second horizontal and in the direction of the meridian (which is that of the Bosphorus near Therapia). At Orsova in Hungary the shocks were violent. At Odessa there were two, one vertical and the other horizontal, from N.W. to S.W.	In Transylvania the buildings first rocked from side to side, with a motion like that of a balloon, and then the walls cracked and fell. At Constantinople the air was calm during the shocks, but the north wind which had been blowing a little before recommenced soon after. At Scutari the shocks were accompanied by a violent wind. At Hermannstadt, a barometer, not fixed to the wall, but suspended, oscillated for more than half an hour. At the same place and at Cronstadt the sky was clear before the earthquake, became clouded at the time, and cleared again afterwards. At Bucharest the serenity of the atmosphere was not disturbed. At Orsova in Hungary the shocks were accompanied by terrible subterranean bellowings and by flames issuing from the earth. At Clarofka also subterranean noise was heard, like the rolling of a huge wagon over pavement.	Comptes Rendus de l'Acad. t. vi. p. 244; Journ. des Débats, 13, 16, 26 et 27 Fév.; Colla, Ann. Astr. 1840 pp. 106, 107; Les Steppes de la Mer Caspienne. t. i. p. 104.	

1838. Jan. 24.	Pouilly, Toisy, and Mont-St.-Jean, in the departm. Côte-d'Or.	Chotin they lasted four minutes. At Clarofta near Cher-son there were two shocks, the first vibratory, the second undulatory and of longer duration. A slight shock.			Journ. des Débats, 16 Fév.; Colla, Ann. Astr. 1840.
— 24 & 25.	Imail, Bender, Reni, &c. in Bessarabia.	More shocks			Pfenniger, Jahresbericht über die Witterungs-Verhältnisse in Würtemberg.
— Night between 24 & 25.	Odessa	Slight shocks		It was remarked that the barometer, which had been in motion for several days, was much more agitated during these shocks.	Authorities for Jan. 23.
— 25. 4 A.M.	Bucharest and Jassy	Another shock, instantaneous and very slight. Shocks were frequent during the last few days in Austrian Galicia, Transylvania, Hungary, Moldavia, Albania, Wallachia, and Bessarabia.			Ditto.
— Feb. 2. At night.	In the valley of Pastusie, Sardinia.	Great subterranean commotion.		Accompanied by an explosion which threw every thing, minerals and vegetables, to a distance. Part of the ground disappeared in fissures. Bells sounded of themselves. Perhaps not an earthquake proper at all.	Journ. des Débats, 31 Mars.
— 10. 4 <sup>h</sup> 55 <sup>m</sup> A.M.	Cronstadt in Transylvania, and the places near.	Some very slight shocks.		During the inundation of the Danube at the end of the winter (some persons said) an earthquake occurred at Pesh. Journ. des Débats, 31 Mars; Moniteur, 2 Avril.	Colla, Ann. Astr. 1840, p. 106, 107.
— 14. 8 <sup>h</sup> 30 <sup>m</sup> A.M.	Foligno and the neighbourhood, States of the Church.	A severe shock, followed by several slighter ones in the course of the day.			Colla.

1.	2.	3.	4.	5.	6.
1838, Feb. 14, 4 <sup>h</sup> 30 <sup>m</sup> and 6 <sup>h</sup> 30 <sup>m</sup> P.M.	Dijon	Two slight shocks		Accompanied by a violent explosion. M. Perrey, although living at Dijon, says that he himself neither felt the shocks nor heard the noise.	Memoir of M. Perrey on Earthquakes in France, Belgium, and Holland, p. 84. Colla.
— 15. 1 <sup>h</sup> 30 <sup>m</sup> A.M.	Foligno	Another shock, more violent than that of the day before. Another severe shock.			Ditto.
— 17. 8 <sup>h</sup> 45 <sup>m</sup> A.M.	Ditto			No damage done. Vesuvius was in a state of rest. On the 21st from noon to midnight magnetic perturbations were observed at Milan.	Ditto.
— 20. to 24.	Naples	Slight shocks			Colla, Ann. Astr. 1840.
— 23. Between 4 & 5 A.M.	In the departm. de la Creuse.	Two shocks		Accompanied by thunder and lightning, hail, rain, and wind.	Ditto, p. 107.
— Night between Fe- bruary 28 and March 1.	Lisbon	A severe shock			Mérian.
— March 5. 9 <sup>h</sup> 30 <sup>m</sup> A.M.	Eglisau and Rheinau, canton of Zurich.	A severe shock			Pfeningger, Jahrsbericht über die Witterungs-Verhältnisse in Wür- temberg. Colla, Ann. Astr. 1840.
— 15.	In Hungary, the Bannat, Transylvania, and Wallachia.	Violent shocks			Annual Register, 1838, p. 39; Shrewsbury Chronicle; Milne's Catalogue of British Earthquakes; Colla, Giorn. Astron. 1840, p. 108.
— 16. About 1 A.M.	Coblentz	A shock		During a very violent tempest	
— 17. 1 P.M.	Shrewsbury and the neighbourhood, ex- tending about nine miles from that town, chiefly in a south or south-east direction. Felt in the villages of Meole, Hanwood, Dor- rington, Longden, Pontesbury, &c.	A very distinct and alarmsing vibratory shock.		Accompanied by a rumbling noise, like that of a train of waggons passing along a paved street. Houses, walls, articles of furniture, &c. shook violently. In some of the coal pits the men were so much alarmed that they came up out of the pits. Bells rang, bricks fell from a chimney, &c. Milne in his Catalogue gives a shock on the 27th at 1 P.M., at this same place, but in all probability the account only refers to the event of the 17th.	
—	In Hungary, the Bannat, Transylvania, and Wallachia.	Violent shocks			Pfeningger, Jahrsbericht über die Witterungs-Verhältnisse in Wür-



1838. May 5. Genoa. Also felt at Piacenza.	Also felt at A very distinct shock, which occurred at 11 <sup>h</sup> 35 <sup>m</sup> .			Colla.
— 22. Meandre in the departm. de la Saône.	Severe shocks, lasting nearly fifteen minutes, but in three separate sets.		Some walls were cracked	Journ. des Débats, 3 Juin; Colla, Ann. Astr. 1840.
— 26. In the district between Halle and Eisleben in Prussia.	Some subterranean commotions supposed to have been felt.		A dull sound was heard, which according to some persons was subterranean.	Pfieninger, Jahrbuch über die Witterungs-Verhältnisse in Württemberg.
— ... Constantinople on the north coast of Africa.	An earthquake			Colla, Ann. Astr. 1840, p. 108.
— June 7. Island of Meleda in the Adriatic.	Two slight undulatory shocks, from W. to E., lasting two seconds.		The first shock was preceded by a slight murmuring noise which ended like the report of a cannon.	Colla.
— 23. Venice and Pesaro. Extended, with even more force than at the latter place, along the coast to Fano and Sinigaglia.	At Venice, three slight shocks, from E. to W. The second immediately succeeded the first, but there was a short interval between these two and third. Total duration = 8 seconds. At Pesaro the shock was undulatory, from E. to W., and lasted five seconds.		At Venice accompanied by dreadful weather; torrents of hail and rain. At Pesaro, a little before the earthquake, many shooting stars were observed, rather brilliant and of large size. They came from the east, and disappeared about the meridian towards the south. At 9 <sup>h</sup> 45 <sup>m</sup> a noise like that of four or five "voitures du poste" was heard, followed immediately by another sound, like that which a compressed gas makes in escaping, and, soon after, the earth began to tremble. All the buildings shook to their very foundations. Soon after the earthquake the water rose four French feet in the wells.	Comptes Rendus de l'Acad. t. vii. p. 89, t. viii. p. 344; Moniteur, 1 Août; Colla.
— July 1. Constantinople	A slight shock.			Colla.
2 <sup>h</sup> 15 <sup>m</sup> A.M.				
— 18. Gibraltar	Shocks			Ditto, Ann. Astr. 1840, p. 109.
11 <sup>h</sup> 45 <sup>m</sup> P.M.				
— 19. Ditto	Ditto. Direction = E. to W.			Ditto.
4 P.M. and 8 <sup>h</sup> 45 <sup>m</sup> P.M.				
— 23. Constantinople, and the country for several leagues round.	Two shocks, the latter of which was very violent. Total duration.			Moniteur, 21 Août.
3 <sup>h</sup> 44 <sup>m</sup> A.M.				

1.	2.	3.	4.	5.	6.
1838, July 30, Turreff in Scotland. (Where is this place?)		ration, 16 seconds. Horizontal undulations from N.W. to S.W. (?)			
— Aug. Night between 2 & 3.	Naples .....	A shock .....			
— 4. Huatusco in Mexico ...		A slight shock.....			
6 P.M., and during the following night.		Several shocks.....			Probably this account and that of the 6th of August only refer to one and the same event. Mr. Perrey. Journ. des Débats, 21 Août; Colla, was an eruption of Vesuvius also during the first few days of the month, accompanied by some shocks. During the night numerous shooting stars were observed.
— 6. Turreff in Scotland. (Where is this place?)		A very slight shock.....			Bull. de l'Acad. Roy. de Bruxelles, t. viii. pt. 2. p. 440.
— 7. Constantinople .....		A vibratory shock, lasting 8 seconds, followed at 5 <sup>h</sup> 7 <sup>m</sup> by another shock, of longer duration, after which slight but frequent oscillations were felt for a quarter of an hour.			Colla, Giorn. Astron. 1840, p. 109.
5 A.M.		A slight shock.....			Colla.
— 9. Fiume and Bukkari on the Adriatic.		A slight shock.....			
In the afternoon.					Ditto; Journ. des Débats, 26 Août.
— 10. Ditto .....		Several shocks.....			Ditto.
2 <sup>h</sup> 30 <sup>m</sup> A.M.		A shock of greater severity than any of the preceding.	Vessels in harbour were dashed against each other.		Bells sounded of themselves at the Fiume. At Bukkari the great tower of the church fell. A terrible noise preceded the shock.
Between 8 & 9 P.M.		A very violent earthquake. The shocks			Ditto.
— 26. In the county of Zolander (Szalad?) in Hungary.					Accompanied by noise like thunder. In some places much damage was done, as at Racz.

1838. Sept. 14. 7 A.M., or according to M. Colla, 9 A.M.	tamberg in Syria. In the counties of Neutra and Comorn only some very short slight shocks were felt. Adderbury in Oxford- shire.	rapidity that they could not be count- ed. A strong vibratory shock. The houses trembled for more than half a minute.	..... A violent shock, last- ing thirty seconds, was felt on board <i>La</i> <i>Claudine</i> of Hâvre, followed by two others not quite so severe, separated by several slight ones of five or six sec- onds, very often repeated, and at in- tervals of about five minutes. The wea- ther was clear and fine, and the sea nearly calm. No visible motion of the latter could be per- ceived.	waters of the Mur were agitated and troubled, and threw a great many small fish up on the bank. Accompanied by subterranean explosions. The sky looked stormy, but there was no thunder.	The Journ. des Débats, 18 Sept.; Colla, Giorn. Astron. 1840, p. 110.
— — — 27. The shocks continued for three- quarters of an hour, and the last oc- curred at 4 <sup>h</sup> 5 <sup>m</sup> A.M.	At sea, in 31° 40' N. lat., and 44° 30' W. long. (doubtless from Paris).	The first shock was the longest and most severe.	..... A violent shock, last- ing thirty seconds, was felt on board <i>La</i> <i>Claudine</i> of Hâvre, followed by two others not quite so severe, separated by several slight ones of five or six sec- onds, very often repeated, and at in- tervals of about five minutes. The wea- ther was clear and fine, and the sea nearly calm. No visible motion of the latter could be per- ceived.	The noise accompanying each shock was exactly that of distant thunder. The whole crew was roused and came on deck, thinking that the ship had struck.	Comptes Rendus de l'Acad. t. viii. p. 32; v. Leonhard, Taschenbuch für Freunde der Geologie, 1846. S. 210.
— — — 29. About 1 <sup>h</sup> or 9 <sup>h</sup> 5 <sup>m</sup> P.M. (?)	Messina and the neigh- bourhood.	A strong undulatory shock.	.....	To the west the shock was so severe that the in- habitants passed the night out of doors. On the 29th and 30th the eruption of Etna was more energetic than ever.	Journ. des Débats, 29 Oct.; Colla.
— — — Night between Sept. 30 & Oct. 1. — — — Oct. 9. 2 P.M.	Ditto At sea, in 27° 37' N. lat., and 31° 7' W. long. (probably from Paris).	Ditto ..... A violent and almost instantaneous shock.	..... Three slight shocks felt on board <i>La Clau- dine</i> , vid. Sept. 27.	..... Ditto.	..... Authorities for Sept. 27.
7 A.M.	Coblentz	.....	.....	From the 11th to the 14th the barometer had gone down from 28 in. 4.2 lines to 27 in. 6.6 lines (French?). On the 13th a remark-	Journ. des Débats, 20 Oct.; Colla.

1.	2.	3.	4.	5.	6.
1838. Oct. 17 to 22.	In the valley of Elsa, Tuscany.	The earth during this period was in a state of continuous agitation. By night the tremblings and by day the noises (thombi) never ceased. Shocks like those of 1804 frequently recurred during the autumn.		able fall of the barometer at Parma, the wind being high and impetuous. On the 14th and 15th the temperature also fell considerably at the same place. But trifling damage done	Pilla.
— 26. 4 <sup>h</sup> 49 <sup>m</sup> P.M.	Avesnes in the departm. du Nord.	A very severe shock...			Colla, Giorn. Astron. 1840.
— Nov. 26. At night.	At the chateau of Laupen in the canton of Berne.	Very slight subterranean commotion.			Ditto.
— Dec. 7. 9 <sup>h</sup> 10 <sup>m</sup> P.M.	... Grief in Scotland ... Zacupan in Mexico	A shock ... Direction N.N.W. to S.S.E.		Great numbers of shooting stars observed for several nights before.	Milne's Catalogue, <i>loc. cit.</i> Bull. de l'Acad. Roy. de Bruxelles, t. viii. pt. 2. p. 440. Mérian.
— 13. At Zurich	...	A slight shock...			Mém. de Turin. 2 sér. t. ii. p. ii.
— Midnight.	In the departm. Isère...	During the period of slight shocks felt at St. Jean-de-Maurienne, earthquakes were also felt in this department. The most severe occurred on this day and on the 26th March following.			
— 19. 10 <sup>h</sup> 29 <sup>m</sup> P.M.	St. Jean-de-Maurienne in Savoy.	A very severe shock...			Comptes Rendus de l'Institut, t. xv. p. 1217.
— 23. 4 P.M.	Woodhouse Eaves on Charnwood Forest, Leicestershire.	on S.W. to N.E.		Preceded by a rumbling noise like that of a heavy waggon.	a Gentleman's Magazine, N. S. vol. xi. pt. 1. p. 198.

1838. Dec. 23. In the middle of the night. 5 <sup>h</sup> 45 <sup>m</sup> or 6 A.M.	La Rochelle	A rather severe shock, lasting half a second.	Accompanied by a noise like the report of a distant cannon. At several places in the de- partment doors were violently shaken.	Gentleman's Magazine, N. S. vol. xi. pt. 1. p. 304; Comptes Rendus de l'Acad. t. viii. pp. 329, 364; Ga- zette de France, 27 Fév. et 30 Mars; Journ. des Débats, 8 Mars; Moniteur, 20 Fév., 8 Mars, et 4 Avril, &c.
— 12. — In the morn- ing.	Berlin, particularly in the northern part of the city.	Very distinct shocks.		Moniteur, 23 Janv.; Colla, Giorn. Astron. 1841, p. 151.
— 14. — 9 P.M.	Suddeah in Upper As- sam.	Apparently from S.W. to N.E.	Preceded by rain and heavy snow in the moun- tains; the air very cold.	Quart. Journ. Geol. Soc. 1845, p. 142, quoting Journ. Asiat. Soc. of Bengal. Colla.
— 17. — 4 <sup>h</sup> 45 <sup>m</sup> A.M.	Milan	A shock indicated by the magnetic needle.		
During the night (of 16-17?).	Salonica	Violent subterranean movements.	Several houses which before threatened to fall were ruined.	Ditto.
— 21. — 6 A.M.	Island of Sainte-Lucie in the West Indies. Also in Martinique. St. Mary, one of the Scilly Isles.	Severe and prolonged shocks, lasting 35 seconds.	More damage done in Martinique.	Journ. des Débats et Moniteur, 4 Avril; Colla, Giorn. Astron. 1841, p. 151.
— Feb. Night between 7 & 8.	Near the village of Bak- likli, 15 wersts west of Bakou in the Cau- casus.	Violent subterranean commotions extend- ed to the distance of 30 wersts.	Accompanying an eruption of flames and mud. The Moniteur of 16 Sept. 1840, gives the date Jan. 26-27 (O. S.), 1840.	Communication of M. Plieninger to M. Perrey. Colla, Giorn. Astron. 1841, p. 151; v. Humboldt, Asie Centrale, t. ii. p. 513.
— 10. — 8 <sup>h</sup> 30 <sup>m</sup> A.M.	Aigueperse, Riom, and Gannat, in the de- partm. Puy-de-Dôme.	A violent shock		Journ. des Débats, 24 Fév.; Moni- teur, 25 Fév.; Colla.
— 25. — 7 A.M.	Borgotaro in Tuscany...	A very distinct shock.	Preceded by a very loud noise	Colla.
— 27. — to June 16.	St. Jean-de-Maurienne in Savoy, and the sur-	Forty-nine shocks were felt during this	Almost all of these shocks were accompanied or preceded by noises, variously compared to	Mém. de M. A. Billiet in Mém. de Turin, 2 sér. t. ii.; Comptes Ren-

1.	2.	3.	4.	5.	6.
	rounding district, including 32 communes. It was remarked that the left bank of the Arc was more severely shaken than the right.	period, of which nine were rather severe and the remainder moderate or slight, besides twenty or twenty-five scarcely perceptible, or local. Another observer reckoned seventy-four shocks. They lasted in general but a few seconds, often consisted of two or three very distinct successive oscillations, and were chiefly in the direction N.W. to S.E. at St. Jean-de-Maurienne. At St. Sorlin-d'Arves and Fontcuverte they were supposed to come from the W. and at Albiez-le-Jeune from the S. or E.		those of a heavy carriage passing over pavement, a violent storm, an avalanche of snow, and distant thunder. This noise seemed to pass from N.W. to S.E., or W. to E. The more severe of these shocks produced cracks in walls in some of the communes, and articles of furniture were violently shaken about. During the principal shocks the atmosphere was obscured by a kind of fog or mist, which soon after dissipated itself. After the shock of the 26th March, which was the most severe, the hot springs of Maurienne increased in quantity of water, their temperature rose, and the water, usually limpid, was troubled. A carefully compiled catalogue of these shocks by M. Billiet is to be found in M. Perrey's 'Mémorial on Earthquakes in the Basin of the Rhone,' p. 57. The summer of 1839 was remarkably dry in Savoy, no rain falling for eighty days, and scarcely any sign of atmospheric electricity manifesting itself; but in September extremely heavy rains set in, which produced inundations in many of the Swiss valleys.	du, t. ix. p. 486; Journ. des Débats et Moniteur, 13, 14, 15 et 18 Mars.
1839, Mar. 12. Palermo ..... 10 P.M.		Two shocks, with an interval of some seconds. Shocks from N.W. to S.E.			Colla.
6 <sup>h</sup> 15 <sup>m</sup> and 7 <sup>h</sup> 25 <sup>m</sup> P.M.	17. In the Upper Engadine, Switzerland.				Mérian.
3 <sup>h</sup> 15 <sup>m</sup> A.M. At Kingussie, between 2 & 3 A.M.	Glengarry in Inverness-shire.	Very severe shocks.	The people in a canal boat felt the shock, and heard the noise reverberating among the hills.	Doors were lifted off the latches. The Moniteur and Colla give the date March 27.	D. Milne's Catalogue, loc. cit.; Moniteur, 5 Avril; Colla, Giorn. Astron. 1841, p. 153.

1839. Mar. 21 to April 1.	San Salvador-de-Guatemala.	Very violent shocks, especially on the 21st and 27th.			A mountain fell, burying beneath its ruins an entire village with all its inhabitants, and dammed up the course of a river. The earth opened, even in the town itself. The inhabitants fled to the open country to avoid being crushed under the walls which fell in all directions. The incessant agitation of the ground and terrible subterranean noises led them to expect the opening of a volcano.	Colla, Giorn. Astron. 1841, p. 153.
— 22. In the morning.	In Syria	An earthquake				Lamont, Annalen für Meteorol. u. Erdmagn. 1842, Heft 1. S. 160.
2 A.M. According to Silliman's Journal, vol. xxxviii, p. 385.	23. Amrapoora throughout the Burmese Empire, extending more than 1000 miles from N. to S.	Two violent shocks from E. to W. at the hour mentioned, followed by slighter ones up to 8 A.M., and feeble tremblings for a year after. The direction of the shocks is also given as N. to S., or vice versa.			Preceded by loud rumbling noise. Huge fissures of 10 to 20 feet in width, and running from N. to S., opened in the ground, from which vast quantities of water and black sand were thrown out, flooding the plains. Volcanic eruptions on the same day in the hills to the south of Kyouk Phvoo.	Asiatic Journal, N. S. vol. xxix. pt. 2. p. 288; Silliman's Journal, vol. xxxviii. p. 385.
— 26.	In the department of the Isère, in the canton of Oisans, at Allemont, Auris, &c.	Frequent shocks during the period of the earthquakes at St. Jean-de-Maurienne. The most severe were on the 16th Dec. 1838, and 26th March 1839 (the day of the most severe shock in Maurienne). The motion was from N.E. to S.W.			The shocks were always preceded by a noise like distant thunder or the fall of an avalanche.	Mém. de Turin, 2 sér. t. ii. p. li.
— April 3. 6 <sup>h</sup> 30 <sup>m</sup> A.M.	Grenoble	A slight shock from E. to W., lasting 2 sec.				Colla, Giorn. Astron. 1841, p. 153.
— 4.	St. Ambroise near Turin.	A shock				M. Billiet in Mém. de Turin, loc. cit.

1.	2.	3.	4.	5.	6.
1839, April 5, 5 P.M.	Florence .....	An undulatory shock from S. to N., followed by another of less intensity, which was again succeeded by a severe shock "en soubresaut." Total duration = 6 or 7 secs. At 6 <sup>h</sup> 45 <sup>m</sup> a very slight shock; at 9 <sup>h</sup> 30 <sup>m</sup> another; and two more during the night.	.....	Preceded by a very loud noise, which lasted about 3 seconds. After the shocks the sky became clouded over, and in the evening very dense clouds formed in the N.W., extending in the form of stratus towards the S.E.	Colla; Lamont, <i>Annales für Meteor. u. Erdmagn.</i> Heft I. S. 160.
— 7.	In Switzerland .....	.....	.....	.....	M. Billiet in <i>Mém. de Turin</i> , <i>loc. cit.</i>
— 8.	Frutigen in the canton of Berne.	A severe earthquake shock.	.....	.....	M. Studer's Catalogue.
— 11.	Interlaken in the same canton.	.....	.....	.....	Ditto.
— 14. At Algiers. Felt rather more strongly in the upper part of the town than in the lower part near the sea. Also strongly felt at Constantine, especially in the centre of the town.	.....	A general vibration violently shook all the houses of the town. It lasted two or three seconds.	The shock was felt on board vessels in port.	Immediately preceded by a subterranean noise, in the direction S.E. to N.E. (?). Some already ruinous walls fell. At the moment of the shock the atmosphere was calm and the sky clear, with a very gentle breeze from the S.E. The preceding night there had been an extraordinary storm, which seemed to be confined to the lower strata of the atmosphere, and was accompanied and followed by abundant showers of hail. At Oran and Bona a terrible tempest, with a frightful sea, prevailed on the 11th, 12th, and 13th, but the earthquake was not perceived at either of these places.	Comptes Rendus de l'Acad. t. viii. p. 763; Journ. des Débats, 29 Avril.
— May 8. Between 11 p.m. and midnight.	In the Bernese Oberland, and the Emmenthal, Switzerland.	A shock from N.W. to S.E.	.....	.....	Mérian.



1839. May 10. After mid- night (of the 9th ?)	Again in the Bernese Oberland.	Another shock.	Ditto.	
11. At Jamulpoor, at 9 <sup>h</sup> 30 <sup>m</sup> A.M.	Comercolly, and Sylhet, in North-eastern India.	Direction at Jamulpoor = W. to E., or N.W. to S.E.	Asiatic Journal, N. S. vol. xxx. pt. 2. p. 15.	
At Comercolly, 9 <sup>h</sup> 50 <sup>m</sup> , and at Sylhet, 9 <sup>h</sup> 55 <sup>m</sup> .			Lamont's Annalen für Meteor. u. Erdmagn. Heft 1. S. 160. Moniteur, 30 Mai; Colla, Giorn. Astron. 1841, p. 154.	
20. In Calabria		Shocks		
22. 11 A.M.	Bridgewater in Scotland (Somersetshire?), and the country for sixteen miles round.	A very distinct shock.		
24. 2 A.M.	Glasgow and environs, and Crieff in Scotland.	Two strong shocks, each of which lasted two seconds, at Crieff.	Accompanied by subterranean noise of much longer duration than the shocks. The weather at Crieff soft next day.	
June 3. 8 P.M.	Suddeeah in Upper Assam.	Apparently from S. to N.	Quart. Journ. Geol. Soc. 1845, p. 142, quoting the Journ. Asiat. Soc. Bengal. Colla.	
7. 2 A.M.	Island of Meleida in the Adriatic.	Slight undulatory shocks from S. to N.		
9. 6 <sup>h</sup> 36 <sup>m</sup> A.M.	Island of Antigua	Violent subterranean commotion, followed the next morning by a slight shock.		
11. —	North of Manchester	A shock		
12. 8 <sup>h</sup> 15 <sup>m</sup> A.M.	In Lancashire, and especially north of Manchester.	A slight shock. According to M. Plieninger, several shocks in Lancashire.	Milne's Catalogue, loc. cit. Lamont's Annalen für Meteorol. u. Erdmagn. Heft 1. S. 160. Doubtless the account given by Milne on the 11th refers to this event.	
16. 8 A.M.	Chospam in Mexico	A slight shock, from W. to E. (?)	Many shooting stars were observed about the time (in June).	Bull. de l'Acad. Roy. de Bruxelles, t. viii. pt. 2. p. 441.

1.	2.	3.	3.	5.	6.
1839, June 29, Sagorbe in Valencia, About 4 P.M. — July 13, Oaxaca in Mexico ..... 9 A.M.		A shock of two seconds' duration. No distinct shocks, but a very violent undulatory motion, from S. 10° W. to N. (!). Lasted one to two minutes.		Accompanied by subterranean and distant rolling noise. Many shooting stars observed on the 10th .....	Moniteur, 15 Juillet. Bull. de l'Acad. Roy. de Bruxelles, t. viii. pt. 2. p. 441.
— Aug. 2, Island of Martinique ... 2 <sup>h</sup> 25 <sup>m</sup> A.M.		Three severe shocks of twelve or fifteen seconds' duration. The motion was sharp, jerking, and horizontal from N.E. to S.W.		The weather had been dry since the earthquake of the 11th of January, but the rain began immediately after this one, during suffocating heat.	Colla, Giorn. Astron. 1841, p. 154; Comptes Rendus, t. ix. p. 415; Moniteur, 12 Sept.; Journ. des Débats, 27 Sept.
— — 7, Annecy in Savoy..... 8 A.M.		A slight shock.....			Colla, Giorn. Astron. 1841, p. 155; M. Billiet, <i>loc. cit.</i> Colla.
— About 2 <sup>h</sup> 20 <sup>m</sup> P.M.	Lucca .....	A strong undulatory shock, from N.W. to S.E., lasting three seconds.			
— 3 <sup>h</sup> 30 <sup>m</sup> and 10 <sup>a</sup> P.M.	Annecy in Savoy.....	Two more shocks: slight.			Colla and M. Billiet, <i>loc. cit.</i>
— 9.	Ditto .....	Another slight shock			Ditto.
— 8 A.M.	Brescia .....	A very severe shock...		Many persons were suffocated in the crowd which rushed out of the Eglise des Miracles.	Colla.
— 9 <sup>h</sup> 30 <sup>m</sup> A.M.					Colla and M. Billiet, <i>loc. cit.</i>
— 8 P.M.	Annecy in Savoy.....	A severe shock .....			Ditto.
— 16.	Ditto. (On the same evening a slight shock at Geneva.)	Ditto .....		Preceded almost immediately, as were all the shocks of the preceding days, by a subterranean noise like a loud clap of thunder. On this day and on the 11th a great number of chimneys were thrown down.	
— 6 <sup>h</sup> 30 <sup>m</sup> P.M.					
— 8 A.M.	Irkutsk in Siberia .....	Three shocks, one of which was severe enough to throw			Colla, Giorn. Astron. 1841, p. 155.

1839. Aug. 27. About noon.	Reggio in Calabria .....	the N.W. A very severe shock, lasting about six seconds.	.....	.....	Colla; Lamont's Annalen für Me- teorol. u. Erdmagn. Heft 1. S. 160; Journ. des Débats, 18 Sept.; Mo- niteur, 19 Sept. Ditto.
1 <sup>h</sup> and some minutes P.M.	Messina .....	A shock, followed by two others at 5 and 8 P.M., and by a third, of two se- conds' duration, at 9 <sup>h</sup> 30 <sup>m</sup> . "Mouve- ment par soubre- sautes." Three mi- nutes afterwards an- other slight shock. Direction of the shocks = S.E. to N. (?). Two more shocks .....	.....	Accompanied by a noise like that of a strong wind. At the moment of the shocks the air assumed a reddish or roseate tinge, as was observed at Parma on the 12th and 13th of March 1832. The wind blew steadily from the N.W.	Ditto.
—	Annecy in Savoy. None of the shocks re- corded at this place were felt in Man- rienne.	Two more shocks .....	.....	.....	Colla and M. Billiet, <i>loc. cit.</i>
— and 29.	28 Messina and Reggio .....	Three more shocks. That on the 28th at 5 <sup>h</sup> 30 <sup>m</sup> (A.M. or P.M.?) was the most severe.	.....	.....	Authorities for the shocks at Mes- sina on the 27th.
— and 31. Sept. 2. 1 A.M.	30 Ditto .....	Two more shocks .....	.....	.....	Ditto.
1 A.M.	Bristol, Newport, Car- diff, and other places in S. Wales, and at Shrewsbury. Felt most at Kingsdown.	A very severe shock .....	.....	East of Bristol, beds rocked, crockery was thrown down, and doors were opened. M. Pieninger gives an earthquake as felt in Monmouthshire and all the West of England on the 8th at 1 A.M., but the date is no doubt erro- neous. Followed by a loud explosion. Probably only the same event as that recorded on the 2nd.	Colla, Giorn. Astron. 1841, p. 156; Lamont's Annalen, Heft 1. S. 160; Mine's Catalogue, <i>loc. cit.</i>
At night.	10. In a great part of Mon- mouthshire.	A severe shock of some seconds' du- ration.	.....	.....	Colla, <i>loc. cit.</i> ; Lamont's Annalen, <i>loc. cit.</i>

1.	2.	3.	4.	5.	6.
1839. Sept. Night between 20 and 21.	Island of Martinique ..	A slight shock.....			Colla, <i>loc. cit.</i> ; Quételet, 2 <sup>e</sup> Mé- moire sur les Etoiles Filantes, p. 57.
— — — 23. After the autumn equinox. Between 7 and 8 p.m.	Island of Jamaica .....	An earthquake shock .....			Ditto.
— — — Oct. Night between 1 and 2.	Kingston in Jamaica ...	A severe shock .....		Accompanied by noise like distant thunder. Perhaps this account refers to the event of the 23rd of September.	Colla, <i>loc. cit.</i>
	San-Salvador-de-Guate- mala.	A formidable earth- quake. Forty-eight shocks were count- ed in twenty-four hours, and others followed on the en- suing days up to the 10th.		All the buildings were seriously injured, and some entirely thrown down. Most of the in- habitants fled to the open country. The town was rendered uninhabitable.	Ditto.
— — — 4 to Dec. 28,	St. Jean-de-Maurienne in Savoy, and the sur- rounding district.	During this period forty-nine principal shocks were felt, and many more in- distinct ones which were not recorded. They generally oc- curred in groups, several at a time. M. Colla reckons forty from the 6th to the 28th Decem- ber, of which four were severe, twelve moderate, and twenty-four slight.		From the 16th June to the 4th October the shocks had ceased at St. Jean-de-Maurienne, but they now began again. The list of indi- vidual shocks by M. A. Billiet is given in Perrey's 'Memoir on Earthquakes in the Basin of the Rhone,' p. 61. They were generally preceded or accompanied by subterranean noise, and sometimes this noise was heard without any sensible shock. After the shock of the 11th December, at 3 <sup>h</sup> 25 <sup>m</sup> A.M., about two minutes later, the horizon appeared bril- liantly lighted, so that one could easily distin- guish the objects in a room.	Memoir of M. A. Billiet, <i>loc. cit.</i> ; Colla, Giorn. Astron. 1841, p. 157.
— — — 17. 10 <sup>h</sup> 25 <sup>m</sup> P.M.	Graiz in Styria .....	Violent shocks, from S.W. to N.E., last- ing 4 secs.			Colla, <i>loc. cit.</i> p. 156; Lamont's Annalen, <i>loc. cit.</i>

1839. Oct. 21 to 26.	Reggio in Calabria .....	Sixty-two shocks during the period mentioned, twenty-six of which were severe, the others moderate or slight.	The most severe shocks were accompanied by a Colla. loud and prolonged noise.	
22. — 23. —	Smyrna .....	A rather severe shock. The intensity varied very much at different places, and was greatest at Comrie in Perthshire. The lines of equal intensity are said to have nearly formed ellipses, of which Comrie was the centre, and of which the longer diameter ran N.E. and S.W., or parallel to the Grampian chain. In and near Comrie there were several distinct undulations, apparently from W. to E. or N.W. to S.E., followed by a trembling or vibratory motion. In more distant places only this trembling was felt. Different persons supposed the ground to be raised from 2 to 6 or 8 inches. The angle made by the wave with the horizon appeared to be at	Accompanied by a very loud noise, variously spoken of as subterranean and aerial, and compared to the loudest thunder, artillery, the blowing up of a magazine, wind amongst the trees, &c. This noise lasted 20 or 30 secs. One person observed the branches of some trees all bent towards the east, as if a strong gale were blowing on them. After they had recovered their erect position not a leaf stirred, but during the time a hollow <i>swish</i> was heard in the air like the draught of a furnace; this continued about 20 secs. after the concussion. At Comrie greater injury of walls, displacement of furniture, and other similar effects were produced than in other parts of the country. On the following day a strange black scum was found on the ground. A similar phenomenon had been remarked several times before on Loch Earn, and occurred again in February and March 1841. A strange kind of sulphurous odour is said to have been perceived in some places, and several persons experienced a feeling of nausea. An electrical discharge was supposed to take place at the time of the shock. Aurora borealis and shooting stars were more frequent than usual in September and October. The weather was very wet, and the barometer, already low, fell for some hours before the shock.	Ditto. D. Milne in Jameson's Edinburgh New Philosophical Journal, vol. xxxv. p. 137; <i>Vide</i> also other vols. referred to below.

1.	2.	3.	4.	5.	6.
1839, Oct. ... Comrie in Perthshire ...		<p>Alloa 1° 18', and in the Carse of Falkirk 3° 47'. The shock seemed to be perpendicular at Comrie. Others appear to have occurred at some places within an hour or two after.</p> <p>Shocks were felt on Oct. 3, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 to 22, 23, 24, 25, 26, 27, 28, 29, 30 and 31. The principal one, the most severe of all those felt at Comrie, was on the 23rd of this month, at 10<sup>h</sup> 30<sup>m</sup> P.M. The character of the shocks was sometimes that of a sudden sharp blow, sometimes undulatory, and sometimes vibratory or tremulous. The direction of the whole series of shocks at Comrie seems to have been most generally E. and W., or N.E. and S.W.</p>		<p>The long-continued series of slight shocks felt at Comrie which here commence have been carefully recorded by Mr. Milne, and it is on his authority, and that of the Reports to the British Association, that the dates and other particulars are given in this Catalogue, from which other accounts occasionally differ. As the shocks were generally of so local and slight a character, they are only noticed once at the end of each month in which they occurred; the separate notice of each shock would give them undue importance in a general catalogue of earthquakes. The shocks were in general very slight, but sometimes rather severe; and were generally accompanied by subterranean noises, variously described as like distant thunder, the reports of artillery, the sound of a rushing wind, &amp;c. The noise sometimes seemed to be in the air, and was often heard without any sensible shock at the time. Several shocks were often felt each day. The shocks were generally felt further N.E. and S.W. of Comrie than in any other direction. In one house of the town, built on a rock, they were much less felt than in any other in the neighbourhood. The weather was generally wet and drizzly, and the rivers were frequently and suddenly flooded. A thin fleecy</p>	<p>Papers by D. Milne in Jameson's Edinburgh New Philosophical Journal, vols. xxxii. xxxiii. xxxiv. xxxv. and xxxvi.; Philosophical Magazine, vol. xx. p. 242; British Association Reports, 1841, 1842, 1843, and 1844; M. Perrey's Catalogue of Earthquakes in the British Islands, quoting chiefly communications from Mr. Macfarlane of Comrie.</p>

			ON THE WHOLE MOST NUMEROUS AND SEVERE IN the month of October. There does not seem to have been any connexion between those at Comrie and those occurring this year at St. Jean-de-Maurienne in Savoy.	
1839. Nov. 2. About 4 P.M.	Geneva.....	A slight shock. Some instants after, a strong shock felt at Sion.	Colla, Giorn. Astron. 1841, p. 157.	
— 3. 2 A.M.	Sion in the Valais .....	Another rather strong shock.	Ditto.	
— 8. 3 A.M.	Coire in the Grisons .....	A shock from S.W. to N.E.	Mérian.	
— 25. —	Rome .....	A vibratory shock .....	Quévalet, 2 Mém. sur les Étoiles filantes, p. 57.	
— —	Comrie in Perthshire .....	Shocks were felt on Nov. 1, 2 to 8, 9, 19 to 28, 29 and 30.	Authorities for October.	
— Dec. 11. Before 1 A.M.	Zürich .....	A vibratory shock .....	Mérian.	
— 17. 6 A.M.	Berne .....	—	Ditto.	
— 24. —	On the coast of Dorset- shire.	A strong vibration .....	Communication of M. Plieninger to M. Perrey.	
— —	Comrie in Perthshire .....	Shocks on Dec. 2, 3, 4, 5, 6, 7, 8, 11, 12, 13 to 18, 20, 24, 28 and 31.	Authorities for October.	
1840. Jan. 2 to March 18.	St. Jean-de-Maurienne in Savoy, and the sur- rounding district.	The shocks still con- tinued in this dis- trict. Ten were felt during the pe- riod mentioned, two of which were of moderate intensity, and all the others slight.	Memoir of M. A. Billiet, <i>loc. cit.</i>	
— 5. A little before midnight.	In the Pyrenees .....	An earthquake .....	Chimneys were thrown down. Four days be- fore, a strong smell of sulphur had been per- ceived, accompanied by subterranean noise, at Bagnères de Bigorre.	Moniteur, 12 Janv.; Colla, Ann. Astron. 1841; Écho du Monde Sav. No. 509.







1.	2.	3.	4.	5.	6.
1840. Mar. 10. At night.	Meyringen in the canton of Berne, Switzerland.	A slight shock.			Mérian; Quételet, Ann. de l'Observ. de Bruxelles, 1843.
— 12. Between 11 p.m. and mid- night.	Ditto	Two severe shocks from S.E. to N.W., followed by a slight one a quarter of an hour later.		The Allgemeine Schweizer Zeitung and M. Stou- der's Catalogue give the date as the night be- tween the 13th and 14th, 1 A.M.	Ditto.
— 13.	Berne			Perhaps only the same with the last. On the 11th, 12th, and 13th, there were storms in the kingdom of Naples; and on the 14th and 15th magnetic disturbances at Prague, and on the 15th at Milan.	On Communication of M. Colla to M. Perrey.
— Night be- tween 16 & 17. About midnight.	Messina	A distinct shock. Fol- lowed by a slighter one at 4 A.M.			Colla.
— 4 <sup>h</sup> 17 <sup>m</sup> P.M. (At Guérande, 3 <sup>h</sup> 30 <sup>m</sup> ).	Nantes, Guérande, and some of the district to the west, departm. Loire-Inférieure.	At Nantes two shocks, separated by an in- appreciable interval. At Guérande, a shock from E. to W.			Moniteur, 28 Mars.
— 8 <sup>h</sup> 13 <sup>m</sup> P.M. At night.	Anney in Savoy. Not felt in Maurienne. Annarapoor, Ava, Tar- quin (?), and many neighbouring villages, Burnah. Comrie in Perthshire	A violent earthquake. Lasted two or three minutes at Amne- rapoor. Shocks felt on March 8, 9, 11, 13, 14, 21, 24, 25, and 27. Two shocks. They became weaker as they passed from E. to W. Three shocks in two minutes.		On the 22nd and 23rd, a magnetic perturbation at Prague. The cities and villages are said to have been almost destroyed and about 300 persons killed.	Memoire of M. A. Billiet, loc. cit.; Colla, loc. cit. 1842, p. 91. Edinburgh New Phil. Journ. vol. xxxvi. p. 364.
— April 5.	Montrond near St. Jean- de-Maurienne, Savoy.				Authorities for October 1839.
— Between 10 & 11 P.M.	Skrawinka in Austrian Poland. Felt also at Vagel and Kestern.			At Lyons, Roquemaure, and Perpignan, a violent thunder-storm on this day.	'Notes Additionnelles' to M. Per- rey's Memoir on Earthquakes in the Basin of the Rhone, p. 21. Communication of Sig. Colla to M. Perrey; Lamont's Annalen für Meteorol. u. Erdmagn. 1 Heft, S. 161.

— 30. In the Carpathian Moun- tains.	or Switzerland ?).	Shocks felt on April 1, 7, 11, 12, and 13.			25th of March).
— May 2.	Comrie in Perthshire	A shock of earthquake		The shock of the 7th was strongly felt at Crieff.	Ditto.
— June 3.	Comrie in Perthshire	Shocks on the 19th and 22nd of the month.			Authorities for Oct. 1839.
— June 5 <sup>th</sup> 20 <sup>th</sup> A.M.	St. Jean-de-Maurienne in Savoy.	A rather severe shock, apparently the last of the long series at this place.			Quételet, Ann. de l'Observ. Roy. de Bruxelles, 1843. Authorities for Oct. 1839.
— 8.	Tours and Candes in the department Indre-et- Loire.	A vibratory shock			Communication of M. A. Billiet to M. Perrey.
— 11.	Athens	Ditto			Lamont's Annalen für Meteorol. u. Erdmagn. 1 Heft, S. 161.
— 20 to July 28 (O.S.). 6 <sup>h</sup> at 45 <sup>th</sup> P.M. At Tiflis, at 7 <sup>h</sup> 10 <sup>th</sup> (P.M.?). At Erivan, at 7 <sup>h</sup> 30 <sup>th</sup> .	The whole district of Mount Ararat in Ar- menia.	A series of violent earthquakes at in- tervals during this period. They after- wards diminished in force, but did not entirely cease in the district of Sharar until September 1. The most severe shocks were on the 20th of June. They were frequent but intermittent, and lasted about two minutes. Followed by others from the 21st to the 28th.	In a few moments the whole aspect of the country in the neighbourhood of Mount Ararat was changed. The shocks gave the earth a move- ment resembling waves. Numerous fissures opened, all parallel to the rivers Araxes and Arpachai; the earth was ploughed up to the distance of a verst from the beds of the rivers, and the fissures were seen to open and shut <i>every moment in accordance with the motion of the earth.</i> There occurred also a great number of vertical explosions from the bottom of holes like little craters, which, opening and closing like the fissures, cast up immense quan- tities of water mixed with sand and gravel. Numbers of the springs were dried up for some time, and continued for several days after to yield only thick and whitish coloured water; others became more abundant than they had been. The first four and most formidable shocks were accompanied by a subterranean noise. Numbers of buildings were cracked and so much injured that they fell on the oc-	Colla. Edinburgh New Philos. Journ. vol. xxxvi. p. 364; Moniteur, 25 Sept., 8 Oct., 23 Nov.; Phalange, 30 Sept.; Majocchi, Annali di Fisica, &c. t. viii. p. 292; Lamont's An- nalen, 1 Heft, S. 161.	

1.	2.	3.	4.	5.	6.
1840, July 2. (O.S. or N.S.) At sunset.	The whole district of Mount Ararat in Armenia.	Last about a minute.		currence of the subsequent shocks. Great damage was done by landslips from Mount Ararat, large masses of rock, ice and snow descending upon the valleys below. Vast masses of rock were thrown down from the mountains. Probably given according to New Style, and referring to the event of June 20, Old Style. M. Pfléniger gives this date also, and states the hour as 6 <sup>h</sup> 45 <sup>m</sup> p.m. He says many houses were thrown down at Nachitschevan, and that some damage was done at Schuscha, but at 8 <sup>h</sup> 6 <sup>m</sup> .	Asiatic Journal, N. S. vol. xxxiv, pt. 2, p. 120.
—	7. Island of Bourbon in the Indian Ocean.	An earthquake			Lamont's Annalen, 1 Heft, S. 161.
—	14. District of Mount Ararat. Felt at Tiflis and Erivan.	Another violent shock.			Authorities for June 20.
—	15. Naples	A slight shock.		A loud subterranean explosion was heard at the same time proceeding from Vesuvius.	Colla.
In the morning. (27 N.S.) About 7 p.m.	District of Mount Ararat.	Another of the violent earthquakes felt in this district. Lasted about a minute.		Terrible damage was done by the fall of a great mass of stones, ice, and melted snow from the mountain. Several of these great slippages seem to have taken place about this time, and devastated the country over a large area. 30000 houses were thrown down in the district of Schavour. Houses also fell in many other places, rocks were thrown down from the mountains, and many persons lost their lives.	Authorities for June 20.
—	25. Ditto	More of these violent shocks.			Ditto.
O.S. 3 and 10 A.M., and 5 P.M.					
—	28. Tiflis	Another shock.			Memoir on Earthquakes in the Caucasus by M. Philadelphine of Tiflis, translated from M. Dureau.

— 30. — (O.S. or N.S.?) District of Mount Ararat. Two severe shocks Extended as far as Tiflis.	tion. Two severe shocks more.			Authorities for June 20.
— 31. — O.S. 3 A.M.	Comrie in Perthshire ...			Memoir by M. Philadelphine above quoted. Authorities for Oct. 1839.
— Aug. 2. — (O.S. or N.S.?) 7 P.M.	In the Khanate of Tal- schyn, district of Mt. Ararat. Felt at Tiflis and Alexandropol.	Shocks were noted on July 3, 11, 16, 17, and 23. Several shocks in one minute. The shocks continued, though but slightly, up to the 8th.	No damage done. On the 6th another landaup from Mount Ararat took place, which did ter- rible mischief, the immense masses of rock, ice, and melted snow destroying or injuring numbers of houses, and leaving no trace of fields or gardens for a space of twenty wersts. The dates of these earthquakes of Mount Ararat are very confusedly reported, chiefly owing to the difference of style. Accompanied by a loud rumbling noise like thunder or that of a carriage. It seemed to pass from E. to W., or according to others, from N.E. to S.W., or N.W. to S.E. The atmosphere was very severe and bright.	Authorities for June 20.
— 9. —	Connecticut and the neighbouring states. Felt at Hartford, Mil- ford, Newhaven, Bridgeport, Derby, Waterbury, Middle- bury, Woodbury; in Massachusetts, but not at Weyfield or north of Litchfield. More strongly felt at Wash- ington, very severe at Worcester, slight at Middleton, and not at all felt at Boston.	At Chester there were fifteen or twenty shocks reckoned, in the direction N.W. to S.W. (?). Dura- tion, half a minute.	Silliman's Journal, vol. xxxix. p. 335; Trumbull's History of Connecti- cut, vol. ii. p. 92.	
— 27. — 0 <sup>h</sup> 52 <sup>m</sup> P.M.	In Styria, Illyria, and Lombardy.	In Styria an undula- tory shock from S. to N. At Venice a very distinct shock, lasting 5 secs., undu- latory, from S. to N.	In Styria much damage was done. Therm. at Venice 24° 9 C. Bar. 28 in. 4 lines (French). The atmosphere was partly obscured by mist.	Communication of M. Colla to M. Perrey.

1.	2.	3.	4.	5.	6.
1840. Aug. ...	Comrie in Perthshire ...	Shocks on the 5th and 6th.			Authorities for Oct. 1839.
— Sept. 2. 8 <sup>h</sup> 15 <sup>m</sup> P.M.	Roquemaure in Languedoc. Also felt at Châteaufort, Cadérouse, Montfaucon, St. Gérald, Tavel, and Saugues.	Two shocks, from E. to W., with an interval of five minutes.		Accompanied by loud subterranean explosions. Some murmurings on the banks of the Rhone disengaged abundance of inflated gases.	Moniteur, 12 Sept.; Voleur, 18 Sept.; Colla.
— 6.	Port-au-Prince in St. Domingo.				Gaz. de Milan, 26 Juin, 1841.
— 10.	Hamilton in Upper Canada.	A violent shock. The oscillations appeared to pass from W. to E.	Pieces of water were violently agitated as if by a storm.	Accompanied by loud subterranean noise. Buildings were violently shaken.	Moniteur, 19 Oct.; Gaz. de France, 19 Oct.; Phalange, 23 Oct.; Colla; Giorn. Astron. 1842. p. 93.
— 19.	Different places in the kingdom of Naples. Felt at Sora, Chieti, the whole of the Abruzzo Citeriore, and especially in the district round Montemaggiella.	Shocks which recurred for several days. During the night, two were felt at Sulmona, one consisting of a sharp blow, the other undulatory.		Accompanied by a dull noise.	Colla; Lamont's Annalen, <i>loc. cit.</i>
— ...	Comrie in Perthshire ...	Shocks on the 19th, 21st, and 26th. Very distinct shocks.			Authorities for Oct. 1839.
— Oct. 18 & 19.	Perrières in the territory of Parma.	An earthquake			Colla.
— 19.	Near Mitterfels in Bavaria.			The same day, magnetic perturbations at Parma, Munich, Prague, Milan, and Brussels. An aurora borealis was seen at Parma and in France. An extraordinary fall of the barometer took place in many parts of Europe. After a violent tempest at Lyons, which began about 7 and ceased about 9 P.M. The weather was terrible at Toulon, Marseilles, &c.	Quêtelet, Annuaire, 1843, p. 290; Lamont's Annalen, <i>loc. cit.</i>
— 27. About 9 P.M.	St. Foy-les-Lyon	A slight shock felt by some people.			"Notes additionnelles" to M. Perrey's Memoir on Earthquakes in the Basin of the Rhone, p. 21.
— 28.	Island of Zante	Violent shocks, especially on the 30th. Followed in the course of a week by about 100 shocks.	The Lord High Commissioner, who was in a steamboat at the time, and within six miles of land		Edinburgh New Philos. Journ. vol. xxxvi. p. 369; Phalange, 27 Nov. et 2 Dec.; Lamont's Annalen, <i>loc. cit.</i> ; v. Leonhard's Taschenbuch
— to 30.					
— On the 30th, in the middle of the day.					

1840. Oct. 31. After midnight of the 30th.	Altman in Thurgovia	A strong shock, which awakened many people.	.....	.....	into the sea. This shock was the most destructive of buildings ever felt in Zante. On the 29th an aurra borealis was seen at Brussels. On the 1st of November, magnetic disturbances at Prague, and on the 1st and 2nd at Munich.	Mérian; Quételet, Annuaire, 1843.
.....	Comrie in Perthshire	Shocks recorded on the 4th, 20th, and 26th. The shock of the 26th moved the instruments, by which vertical motion to the extent of half or three-quarters of an inch, and horizontal motion towards W. by N. to the extent of half an inch, seemed to be indicated.	.....	.....	.....	Authorities for October 1839.
Nov. 5. 3 A.M.	Various places in Calabria. In the Saron Voigtland. Felt at Aarau.	Shocks. At Brambach there were three, rapidly succeeding each other, from N.W. to S.E. Followed at 1 <sup>h</sup> 20 <sup>m</sup> P.M. by another shock, of greater intensity, and in the same direction. At 6 P.M. there was another, very severe; and several slight ones occurred during the following night. A rather violent shock, from N.W. to S.E., followed by two oscillations.	.....	.....	Accompanied by noise like thunder	Colla; Écho du Monde Sav. Nr. 587. Lamont's Annalen, loc. cit.; Communication of M. Plieninger to M. Perrey.
6 <sup>h</sup> 53 <sup>m</sup> A.M.	Bessas and Barjac in the departm. Gard.	.....	.....	.....	.....	Quotidienne, 18 Nov.; Phalange, 22 Nov.; Colla, Giorn. Astron.

1.	2.	3.	4.	5.	6.
1840. Nov. 11. At night.	Philadelphia	A severe shock	Accompanied by a great and unusually sudden swell in the Delaware.		Edinburgh New Philos. Journ. vol. xxxvi. p. 365.
9 P.M.	14. Newhaven in Connecticut.	A shock		Accompanied by noise	Silliman's Journal, vol. xl. p. 376.
—	25. Nachicheewan in Arnetina, and the neighbouring districts.	A vibratory shock, which lasted forty seconds.		No damage done.	Quetelet, Annuaire. 1843; Plieninger, Jahrsbericht über die Witterungs-Verhältnisse in Württemberg.
—	26 Ditto	Two more shocks, slight.			Plieninger, <i>loc. cit.</i>
— and 27.	Ditto. More violent in the circle of Scharus.	The oscillations recurred more or less slightly up to December 7, O.S.		Houses were thrown down in the circle of Scharus.	Ditto.
—	Comrie in Perthshire	Shocks were felt on November 12, 13, 16, and 24.			Authorities for October 1839.
— Dec. Night between 9 and 10.	Belley in the departm. Ain. Felt in several communes on the banks of the Rhone.	A rather violent shock		No damage done.	Moniteur et Gaz. de France, 19 Déc.; Phalange, 23 Déc.; Gaz. Piém. 14 Déc.; Colla, Giorn. Astr.
— 4 <sup>h</sup> 18 <sup>m</sup> A.M.	Chambery in Savoy	A strong shock from E. to W.		Probably the same with the last. It is remarked that shocks had been pretty frequent in the sub-alpine regions for fifteen years before.	Ditto.
— 25.	On the eastern shore of the Black Sea.	An earthquake shock			Lamont's Annalen, <i>loc. cit.</i>
1 <sup>h</sup> 24 <sup>m</sup> A.M.	Clagenfurth in Carinthia. Also felt at Ferlach in Swabia.	A shock, from S.W. to N.E., lasting two or three seconds.		Accompanied by noise like the rolling of a carriage.	Moniteur, 17 Janv. 1841.
6 <sup>h</sup> 37 <sup>m</sup> P.M.	Cosenza in Calabria	A severe shock, lasting about fifteen minutes (?).			Phalange, 27 Janv. 1841; Lamont's Annalen, <i>loc. cit.</i>
— 6 <sup>h</sup> 30 <sup>m</sup> A.M.	Smyrna, and Pyrgos in the Peloponnesus.	A violent shock			Gaz. Piém. 26 Janv. 1841; Lamont's Annalen, <i>loc. cit.</i>
— 31.	Comrie in Perthshire	Shocks noticed on Dec.			Authorities for October 1839.



night.	S.W. The shocks came from the Calabrias, and not from Etna.			
— 4. Ditto	More shocks			Ditto.
— 6. Ditto	Ditto			Ditto.
— 15. At Algiers	Shocks at these hours			Lamont's Annalen, 1842. S. 161; Colla, Not. Météor.
In the morning and at noon.				
— 21. Malta	A distinct but only momentary shock.			Colla.
— 25. In the State of New York.	Shocks which lasted fifteen or twenty seconds. Direction = W. to E.			Accompanied by a noise like that of loaded waggons.
— 31. Caermarthen, and several other towns in Wales.	A smart shock, accompanied by a very visible tremor of the earth.			Accompanied by a rumbling noise similar to the sound of distant thunder. It is to be observed that a shock occurred at Comrie in Perthshire at about 2 A.M. on the same morning. Similar shocks are said to have been observed about the preceding month of November in the neighbourhood of Llanstephan.
— Between 3 and 4 A.M.				Jameston's Edinburgh New Philos. Journ. vol. xxxvi. p. 76.
— Feb. 3. 7 P.M.	Eglisan in the canton of Zurich.			Authorities for October 1839.
— Feb. 3. 7 P.M.	Eglisan in the canton of Zurich.			From the 1st to the 5th magnetic perturbations at Cracow, and on the 2nd at Naples.
— or 11.	Gowhaty in Upper Assam.			This account is considered doubtful by M. Perrey. Communication of M. Colla to M. Perrey.
— or 11.	Gowhaty in Upper Assam.			Accompanied by a low rumbling noise. In this month a splendid meteor was seen all through Upper Assam.
— or 11.	Gowhaty in Upper Assam.			Quart. Journ. Geol. Soc. 1845, p. 142, quoting Journ. Asiat. Soc. of Bengal.

1.	2.	3.	4.	5.	6.
1841. Feb. 15. In the morn- ing.	Oporto in Portugal .....	A shock .....	.....	.....	Lamont's Annalen, Heft 1. S. 162; Queflet, Annuaire, 1843, p. 253.
— 18. 5 and 11 P.M.	Genoa .....	Slight shocks at the hours mentioned. Very severe shocks .....	.....	On the same day there fell three showers of red rain.	Comptes Rendus de l'Acad. t. xiii. p. 215. Moniteur, 13 et 28 Mars; Lamont's Annalen, <i>loc. cit.</i> ; Colla.
Night between 20 and 21.	Various places in the kingdom of Naples.	.....	.....	.....	.....
— 26. About 7 P.M.	Island of Zante .....	A most alarming shock of earthquake. The vibration continued from thirty to thirty- five seconds. The shocks afterwards recurred daily.	.....	.....	.....
—	Island of Martinique .....	Shocks .....	.....	.....	.....
—	Comrie in Perthshire .....	Shocks on the 1st, 14th, and 16th.	.....	.....	.....
— Mar. 6. 1 P.M.	In the island of Ischia, near Naples. The centre of disturbance seems to have been Casa-Miciola.	A severe shock, last- ing some seconds, and followed, six minutes after, by a slighter one.	.....	.....	.....
— 9. 11 <sup>h</sup> 30 <sup>m</sup> P.M.	Athens .....	A vertical shock .....	.....	.....	.....
— 17.	Constantinople .....	Two shocks .....	.....	.....	.....
— 19. 5 <sup>h</sup> 30 <sup>m</sup> A.M.	Egilsan in the canton of Zurich.	A much stronger shock than that of Febru- ary 3, and felt over a larger district. Ten minutes later, another slighter shock.	.....	.....	.....
— 20. In the evening.	Island of Lipari. The west coast of Sicily was also slightly	A vibratory shock, the most violent re- membered by the	.....	.....	.....

1841. Mar. 22. 6 <sup>h</sup> 34 <sup>m</sup> A.M.	Coblentz, along the Moselle between that town and Treves, up the Rhine as far as Camp in the Duchy of Nassau, and on the Lahn.	.....	.....	Accompanied by very loud noise. The steersman of one of the steamers declared that he saw a blue flame rise from a hill in the distance, which remained suspended in the air for a time, and then sank and disappeared upon the spot it rose from. On the 22nd and 23rd, magnetic perturbations at Parma, Munich, Geneva, Prague, Brussels, Toronto, and St. Helena, and on the 24th at Milan, Naples, St. Petersburg, and Catherinenberg. Meteors were observed at several places.	Moniteur, 28 Mars; Lamont's Annalen, Heft 1. S. 168; Edinburgh New Philos. Journ. vol. xxxvi. p. 367.
— 25.	In Georgia (Caucasus).....	Earthquake shocks on this day and the two next mentioned.	.....	.....	Quételet, Annuaire, 1843, p. 294.
— 26.	Ditto .....	.....	.....	.....	Ditto.
— 30.	Ditto .....	.....	.....	.....	Ditto.
—	In Calabria .....	More shocks .....	.....	.....	Lamont's Annalen, <i>loc. cit.</i>
—	Comrie in Perthshire .....	Shocks on March 6, 10, 11, 22, and 23.	.....	On the 10th the two inverted pendulums kept at Comrie had their points thrown half an inch to the west. On the 22nd these instruments were also affected, but not to the same extent.	Authorities for October 1839.
— April 1.	In Georgia (Caucasus).....	Earthquake shocks .....	.....	.....	Quételet, Annuaire, 1843, p. 294.
— 3.	Seiches in the departm. Maine-et-Loire.	A rather severe shock, from E. to W.	.....	Accompanied by subterranean noise .....	Moniteur, 13 Avril; Gaz. Piém. 21 Avril.
About 1 P.M.	In Jutland, and Schleswig Holstein.	Severe shocks .....	.....	Houses were violently shaken, and chimneys were thrown down. The barometer remained in its ordinary condition.	Moniteur, 16 Avril; Colla, Giorn. Astron. 1842, p. 96.
3 <sup>h</sup> 30 <sup>m</sup> P.M.	.....	.....	.....	.....	.....
— 13.	Port-au-Prince in St. Domingo.	.....	.....	.....	Colla; Ann. de l'Observ. de Bruxelles, t. iii.
— 19.	Oban in Argyleshire .....	Shocks, which do not appear to have been felt at Comrie in Perthshire.	.....	.....	Edinburgh New Phil. Journ. vol. xxxvi. p. 76.
5 <sup>h</sup> 30 <sup>m</sup> A.M., 11 A.M., and 2 <sup>h</sup> 30 <sup>m</sup> P.M.	.....	.....	.....	.....	.....
— 21.	Ditto .....	Ditto .....	.....	The shock was felt severely at the Lismore light-house (103 feet high), which vibrated so as to cause the reflector frame and glasses of the lantern to tingle. The watcher heard a loud noise like that of a cannon discharged at a short distance. This noise was heard at the bottom of the light-house, but the vibration	Ditto.
1 <sup>h</sup> 35 <sup>m</sup> A.M.	.....	.....	.....	.....	.....



854.	Mazara in Sicily. Some places in the kingdom of Naples.	to N. Shocks				nalen, <i>loc. cit.</i> ; Colla. Ditto.
—	Comrie in Perthshire ...	Shocks were felt on May 5, 8, 22, 26, 27, 28, and 30.				Authorities for Oct. 1839.
— June 1.	Kingston in Jamaica ...	An earthquake			Preceded by heavy rains.	Edinburgh New Philos. Journ. vol. xxxvi. p. 367.
— 5.	Athens	Very severe shocks				Lamont's Annalen, Heft 6. S. 221.
11 <sup>h</sup> 40 <sup>m</sup> A.M.	Several places in the kingdom of Naples.	Strong undulatory shocks from S. to N.				Journ. des Débats, 12 Juillet; Moniteur, 20 Juillet; Lamont's Annalen, Heft 1. S. 160.
— 9.	Ditto. Felt at Sulmona.	Ditto				Ditto.
— 10.	Ditto. Felt at Lancrano. In Sicily also these shocks were perceived, but there they were of but slight intensity.				At Tarante houses were thrown down	Ditto.
— 12.	St. Louis, near the junction of the Mississippi and Mississippi.	An earthquake				Edinburgh New Philos. Journ. vol. xxxvi. p. 368.
— 4 P.M.	Island of Terceira, Azores.	An earthquake, which recurred with greater severity at 5 <sup>h</sup> 25 <sup>m</sup> P.M.				Edinburgh New Philos. Journ. vol. xxxvi. p. 367; Journ. des Débats, 15 et 16 Juillet; Moniteur, 16 Juillet; Lamont's Annalen, Heft 1. S. 162; v. Leonhard's Taschenbuch, 1 Jahrgang, 1846. S. 205.
— 13.	Ditto	Tremblings felt at short intervals during the day.				Ditto.
— 14.	Ditto	A perfectly perceptible undulation.			A number of buildings were destroyed	Ditto.
4 A.M.	Ditto. Only some of the severer shocks were felt in the adjacent islands.	A distinctly visible rocking motion. The ground then remained comparatively quiet up to			The Villa da Praia de Victoria was reduced to a complete ruin. Not a single house or edifice escaped. Several villages in the neighbourhood were destroyed in the same manner. Every convulsion was preceded by a loud subterranean or submarine noise, which exactly	Ditto.
3 <sup>h</sup> 30 <sup>m</sup> A.M.						

1.	2.	3.	4.	5.	6.
1841. June 15. — 16.	Paia in Portugal ..... Several places in the kingdom of Naples.	2 <sup>h</sup> 40 <sup>m</sup> A.M. on the 16th, when another violent shock was felt. Others were felt at intervals up to the 24th of the month. A vibratory shock ... Strong undulatory shocks from S. to N. They continued to be felt at Sulmona up to the end of the month. Several shocks .....		varied in intensity with the force of the shocks. A rent of a mile in length was formed in the ground, extending from the shore. The soundings around the island were not altered.	Quételet, Annuaire, 1843, p. 295. Moniteur, 20 Juillet; Journ. des Débats, 12 Juillet; Lamont's An- nalen, Heft 1. S. 160.
— 21. 11 P.M.	Büsserach and Rhein- wyl, in the canton of Soleure.	A shock followed by a second in a few mi- nutes. Both ex- tremely slight. Shocks .....		Accompanied by rolling noise from S.W. to N.E. Mérian.	
About 10 A.M.	In the departm. Indre...			Accompanied by a sharp and prolonged subter- ranean noise.	Vid. authorities for July 5.
11 <sup>h</sup> 15 <sup>m</sup> and 25 <sup>m</sup> (A.M. or P.M. ?).	Châtillon-sur-Indre, and Buzancais.			Accompanied by loud subterranean noise.....	Ditto.
— July 1.	Comrie in Perthshire .....	A single shock on the 29th.			Authorities for October 1839.
—	Châtillon-sur-Indre, and Buzancais.	Another shock .....		A strong S.W. wind on the four following days.	Authorities for July 5.
—	Bayazid in Georgia.....				
2 <sup>h</sup> 7 <sup>m</sup> P.M.	Monterey in California. Felt on the farm in the interior.	Another shock. There were four oscilla- tions, horizontal, from N. to S.	Felt at sea .....	The town was swallowed up in consequence of an earthquake. The account requires confirmation. Preceded by a terrible noise like the increasing roll of thunder, which lasted about twenty seconds. Meteorological and magnetical in- struments were not affected. Earthquakes are said to be frequent in California.	Gazette de France, 21 Août. Duflot de Mafrais, Exploration de l'Océan, t. ii. p. 56.
About 9 <sup>h</sup> 30 <sup>m</sup>	Kinlochmoidart in Ar- gyleshire.	A slight shock.....		Accompanied by rumbling noise .....	Edinburgh New Philos. Journ. vol. xxxvi. p. 76.

1841. July 5. Early in the morning. At Leblanc-sur-Indre, about midnight of the 4th. At Bligny-sur-Ouche, near Army-le-Dec, between midnight of the 4th, and 0 <sup>h</sup> 30 <sup>m</sup> A.M. of the 5th. At Bourges, 0 <sup>h</sup> 30 <sup>m</sup> A.M. At Caumacré, near Roche-more, south of Tours, about midnight. At Lange-ton (Valençay (Indre)), 0 <sup>h</sup> 28 <sup>m</sup> . At Pont-Levoy, 0 <sup>h</sup> 30 <sup>m</sup> . At Quincay, S. of Blois, at 0 <sup>h</sup> 30 <sup>m</sup> and about 3 <sup>h</sup> 30 <sup>m</sup> . Near Nogent-sur-Vernisson (Loiret), 0 <sup>h</sup> 45 <sup>m</sup> . At Chartres, Longjumeau, Grignon	Over a large part of Central France. The principal places where the earthquake was felt are noted in the other columns.	At Leblanc-sur-Indre, the shocks were severe enough to shake the furniture of the houses violently. At Bligny-sur-Ouche, three shocks, equally strong. At Bourges a kind of heaving motion; there were two shocks, followed by a third, very slight, one at about 3 A.M. At Caumacré, a severe shock from N. to S., lasting two or three seconds. At Lange-ton the most severe shock at 0 <sup>h</sup> 28 <sup>m</sup> was followed by a second four or five minutes later, by a third at 3 <sup>h</sup> 44 <sup>m</sup> , and a fourth, very slight, at 3 <sup>h</sup> 45 <sup>m</sup> ; apparent direction = S. to N. At Pont-Levoy, the first shock was from N. to S., and was followed by another at 3 <sup>h</sup> 30 <sup>m</sup> . At Quincay the first shock was severe, apparently from W. to E.; but the second was of less force. At Nogent-sur-Vernisson, a violent	Accompanied at Bourges by a loud noise, as if a heavy load had been thrown down in one of the upper stories. At Caumacré the noise was compared to that of a dozen diligences rolling together over the pavement. In the evening it was remarked that the upper clouds were impelled by a south wind and the lower by a north. At Pont-Levoy a deep heavy sound was heard; articles of furniture shook; the wind was very strong, and it rained heavily. At Quincay the noise was compared to that of carriages on a pavement, or the rolling of distant thunder. Near Nogent-sur-Vernisson the sky was clouded but calm, and the heat suffocating. At Rambouillet the noise was very loud; the sky was calm, but a storm was approaching. In the department de l'Indre a clock which had been stopped in February 1840, and had been left so, was again set in motion by this earthquake, and struck the hours. No effect of any note was produced on the instruments of the observatory at Paris. At Genesee (Seine-et-Oise) and Orleans, where the shocks were felt, the weather was lowering, and the atmosphere seemed charged with electricity. At Marseilles on the 14th and Cette on the 17th extraordinary movements of the sea were observed.	pp. 28, 80, 149, 232; l'Institut, Nra. 394 et 396; Moniteur, et Journ. des Débats, 8, 9, 10 et 11 Juillet.
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1.	2.	3.	4.	5.	6.
<p>(Seine-et-Oise) Orsay, Sèvres, Meulan, and Paris, about 0<sup>h</sup> 30<sup>m</sup> A.M. At Donnemarie (Seine-et-Marne), 0<sup>h</sup> 40<sup>m</sup>. At Rambouillet, about 0<sup>h</sup> 37<sup>m</sup>.</p>		<p>shock from N. to S.; objects were visibly set in motion. At Chartres, and Longjumeau, a severe shock. At Donnemarie, three severe shocks, apparently from S. to N. At Rambouillet, a violent oscillation from W. to E. At Grignon, a rather severe shock from N.E. to S.W. At Orsay seven shocks were counted; the first was the most severe and from S. to N. At Sèvres three shocks from W. to E. At Chevreuse a strong shock from N.E. to S.W. At Meulan, 3 shocks from N. to S. At Paris, also 3 shocks; general direction = N.E. to S.W.</p>			
<p>1841. July 8. In the kingdom of Naples</p>	<p>Shocks.....</p>	<p>A severe shock</p>		<p>Unproductive of damage</p>	<p>Comptes Rendus, t. xiii. p. 449; Quotidienne, 6 Août; Colla. Ditto.</p>
<p>— 10. Cosenza and Catanzaro in same kingdom. Midnight.</p>	<p>Vienna. More severe at Neustadt. Very slight at Gratz.</p>	<p>At Vienna, a slight shock consisting of three quick vibrations from N. to S. At Gratz the direction was also N. to S.</p>		<p>At Neustadt buildings were injured</p>	<p>Journ. des Débats et Moniteur, 27 Juillet; Lamont's Annalen, Heft 1. S. 162, Heft 2. S. 178.</p>



1841. July 13. Potenza in the kingdom of Naples.	A slight shock.	.....	.....	Accompanied by a vibration in the air like that produced by a discharge of artillery. Several walls were thrown down.	Authorities for July 8.
Between 4 and 5 P.M.	An earthquake	.....	.....	.....	Moniteur, Journ. des Débats, Phalange et Quotidienne, 6 Août; Lamont's Annalen, Heft 1. S. 161; Colla, Giorn. Astron. 1842, p. 97.
15 15 <sup>m</sup> P.M.	Shocks, which at Naples lasted twenty seconds. Direction = N.E. to S.W.	.....	.....	Vearvius sent forth a little smoke	Authorities for July 8.
3 <sup>d</sup> 15 <sup>m</sup> P.M.	A slight shock.	.....	.....	.....	"Notes additionnelles" to M. Perrey's Memoir on Earthquakes in the Basin of the Rhone, p. 21.
18. In the afternoon.	Three shocks	.....	.....	On the 17th, 18th, and 20th, magnetic perturbations at Cracow; on the 18th at Brussels; on the 19th and 20th at Toronto and St. Helena; and on the 20th at Munich. On the 17th and 18th storms and extraordinary heat in many parts of Europe.	Lamont's Annalen, Heft 1. S. 162.
11 P.M.	A slight shock, lasting two seconds.	.....	.....	.....	Colla.
2 <sup>d</sup> 30 <sup>m</sup> A.M.	Three shocks, one of which was very severe.	.....	.....	The principal shock was accompanied by a loud noise coming from the west. The heat was very great on the 17th and following days.	Moniteur, 2 Août.
30. Lisbon and Leira in Portugal.	Several shocks.	.....	.....	.....	Moniteur, 17 et 19 Août; Phalange, 20 Août; Journ. des Débats, 16 et 17 Août; Lamont's Annalen, Heft 1. S. 163; Écho du Monde Sav. No. 661 et 25 Août; Colla, Giorn. Astron. 1842, p. 97; Quetelet, Annuaire, 1843, pp. 296, 297.
In Westphalia.	An earthquake	.....	.....	.....	Quetelet, Annuaire, 1843, p. 294.
Comrie in Perthshire	Shocks were felt on July 2, 23, 25, 26, 30, and 31.	.....	.....	The shocks on the 23rd, 25th, and 26th were rather severe, affecting the instruments to the extent of about half an inch. That on the 30th was still more violent, as, although the motion of the instruments was only about the same (half an inch), the effects on buildings were much greater; chimney-tops were broken, walls rent, &c. Trees vibrated from their very	Authorities for October 1839.

1.	2.	3.	4.	5.	6.
1841. Aug. 2. 10 P.M.	Lisbon and Leira in Portugal.	A slight vibratory shock.		The direction seems to have been N. to S. There were nine or twelve other shocks felt on the same day, and the principal one extended over a much greater area round Comrie than usual.	Authorities for July 30.
10 <sup>h</sup> 18 <sup>m</sup> (A.M. or P.M.?).	Ditto	Another shock		No serious mischief is mentioned as having been done, but the inhabitants had taken flight in alarm.	Ditto.
In the evening.	Seville and Malaga in Spain.	Two severe shocks			Ditto.
1 <sup>h</sup> 42 <sup>m</sup> P.M.	St. Pierre in the island of Martinique.	Strong horizontal oscillations from N.E. to S.W. There were three distinct shocks, of gradually increasing intensity.		The barometer was variable; it fell one line a quarter of an hour after the earthquake, and the weather, which had been excessively hot, suddenly changed to rain.	Phalange, 19 Sept.; Colla, Giorn. Astr.
—	Several places in Central Spain.	Shocks			Authorities for July 30.
—	6. Tangiers in Morocco	Ditto			Ditto.
—	7. Seville and several other places in Spain.	Several shocks		Accompanied by noise	Ditto.
10 <sup>h</sup> 30 <sup>m</sup> P.M.	15. Messina	A severe shock, followed, two hours later, by two others.			Gaz. Piem. 10 et 15 Sept.
About 3 <sup>h</sup> 30 <sup>m</sup> A.M.	Parna	A slight shock; at once vertical and horizontal, from E. to W. Lasted about four seconds.			Ditto.
8 <sup>h</sup> 9 <sup>m</sup> P.M.	Island of Antigua	A shock, described as a sudden and severe jerk, with a short subsequent tremor.			Edinburgh New Philos. Journ. vol. xxxvi. p. 371; Courier de la Côte-d'Or, 14 Oct.; Colla, Notizie Meteorol. 1841, 42, 43, p. 9; Lanont's Annalen, Heft 1, S. 163.
—	17. Islands of St. Lucia, Martinique, and Guadeloupe.	In St. Lucia a shock of appalling violence.		Preceded in St. Lucia by a hoarse rumbling noise. No serious damage was done, only a	Ditto.

1841. Aug. 18. About 9 A.M.	Castrovillari in the kingdom of Naples, and the environs.	loupe there were two violent shocks, and in Martinique two or three. A slight shock, lasting four seconds.			Gaz. Piém. 10 et 15 Sept.
— 24. 4 A.M.	Sulmona in the same kingdom.	A slight undulatory shock.			Ditto.
— 25.	Caramanico in the same kingdom.	Rather a severe shock.			Ditto.
— .....	Comrie in Perthshire	Shocks felt on August 1, 10, 12, and 30, all very slight.			Authorities for October 1839.
— Sept. 1. Probably O.S. Between 1 and 2 A.M.	Nijne-Taglak on the eastern slope of the Oural. Also felt at Tchernoe-Estolschinsk.	A shock from W.S.W. to E.N.E. A man who was fishing at the time said that the oscillation came from the N.		<p>Preceded by subterranean noise like distant thunder. At dawn the sky was clouded and of a very distinct roseate tint ("avec des étincelles"), which afterwards changed to an orange-yellow colour. This became momentarily so intense that the nearest objects could be discerned, but with difficulty. About 9 A.M. a little rain fell, but the atmosphere retained the same strange appearance up to a late hour of the evening. A similar state of the atmosphere was observed at Perm, Vicimo-Outkinak, and Tchernoe-Estolschinsk; but at the two former places, on the west of the Oural chain, the shock was not felt. A fisherman reported that the fish came up to the surface of the water in a state of great agitation.</p> <p>The shock was so sudden that the persons who escaped from the houses had scarcely time to fly. The whole district about Carthago was covered with ruins. At Turodo, Trea-Rios, Carthago, Parowso, Ujaméa, and even in the neighbourhood of Matina (Nicaragua) not a single hut was left standing. The houses not</p>	<p>Moniteur, 8 Déc.; Bull. de l'Acad. de Bruxelles, t. ix. pt. 1. p. 188; Lamont's Annalen, Heft 1. S. 161; Colla.</p>
— 6 A.M.	Carthago in the province of Costa-Rica, Central America. Also strongly felt in the United States.	An unusually sudden and violent shock. Followed by many more up to the 5th.			<p>Journ. des Débats, 16 Janv. 1842; National, 11 Déc. 1841; Lamont's Annalen, Heft 1. S. 163.</p>

1.	2.	3.	4.	5.	6.
1841. Sept. 19. In Styria .....		An earthquake shock		completely thrown down had to be pulled down. From San-José to Heredia and Alajuela the whole country was covered with ruins.	Communication of Signor Colla to M. Perrey.
— 20. — 19 Nauplia in Greece .....		Shocks on the two days mentioned.			Ditto.
— — — — — Comrie in Perthshire ...		Shocks recorded on Sept. 8, 9, 10, 16, 17, 22, 23, and 29.		The shocks during the night of September 9–10 were severe enough to move the instruments half or three-quarters of an inch. The weather for the two preceding days was remarkably wet and close.	Authorities for October 1839.
— Oct. 5 Constantinople .....		A strong vibratory shock			Colla; Lamont's Annalen, Heft 6. S. 221.
— 6. In the morning (of the 6th?) .....		A slight shock			Quételet, Ann. de l'Observ. de Bruxelles, 1843, p. 298; Lamont's Annalen, Heft 2. S. 193. Colla; Lamont's Annalen, Heft 1. S. 184.
— 9. Parma .....		A very slight shock, undulatory, from S.E. to N.W., lasting about 3 secs.			Authorities for Oct. 6.
— 13. Ditto .....		A slight shock.			Ditto.
— 14. Monte-Leone in Calabria-Ultra, and several other places in the kingdom of Naples.		A slight shock.			Journ. des Débats, 20 Déc.; National, 4 Déc.; Lamont's Annalen, Heft 1. S. 163; Colla.
— 15. Sanguinetto in the province of Verona.		The first shock, at the hour mentioned, was followed by another ten minutes later, by a third at 2 <sup>h</sup> 45 <sup>m</sup> , a fourth at 3 <sup>h</sup> 30 <sup>m</sup> .		Each of the shocks was accompanied by dull explosions, and a kind of hissing noise which seemed to pass rapidly through the air. The night was calm and the sky very clear. Numerous luminous streaks like those left behind by shooting stars were observed. The explosions seemed to come from the S.W.	Colla.

1841. Oct. 16. 11 P.M.	Ditto		companied by un- dulation.	Another slight shock.			Ditto.
— — — — —	Wersen near Salzburg in the Tyrol.						Ditto; Communication to M. Perrey.
— 18. 2 <sup>d</sup> 30 <sup>m</sup> P.M.	Torre-di-Passeri in the A Abruzzo, kingdom of Naples. Felt also at some other places.	A very severe shock.			No damage done.		Authorities for the 14th.
— — — — —	Reggio and Messina in Sicily.	At Reggio, a violent shock. Still strong- er at Messina.					Ditto.
— Night between 20 and 21.	In Sicily again	More shocks					Ditto.
— Night between 21 and 22, and 24.	Comorn in Hungary	Very violent shocks			All the houses built entirely or in part of wood were thrown down, and the others more or less injured.	Journ. des Débats, 12 Nov.; Quo- tidienne, 16 Nov.; Phalange, 17 Nov.	
— 24. 2 <sup>d</sup> 8 <sup>m</sup> P.M.	Cologne	A violent earthquake, equal to that of thirty years before (13 May, 1812?). Lasted two seconds.			Accompanied by subterranean noise. Houses were violently shaken, walls cracked, and chimneys thrown down. A hot and disagree- able wind had prevailed all the morning. On the same day magnetic perturbations were observed at Cracow, Nertachinak, Toronto, and St. Helena; and on the next day at Cra- cow, Parma, Brussels, Milan, Naples, Prague, and St. Helena.	Journ. des Débats, Quotidienne, et Moniteur, 19 Nov.; Phalange, 26 Nov.; Colla, Notizie Meteorol.	
— — — — —	Constantinople	A violent shock					Moniteur, 26 Nov.
— Night between 27 and 28.	St. Jean-de-Maurienne	A shock			Great oscillations of the barometer were ob- served at St. Jean-de-Maurienne during the month. During the night of Oct. 24–25 a <i>doubtful</i> earthquake at Revermont in the de- partm. de l'Ain.	"Notes additionnelles" to M. Per- rey's Memoir on Earthquakes in the Basin of the Rhone, p. 21.	
— 28.	in Savoy.				There was also a storm of wind and rain on this day.		
— 29.	Sanguinetto in the pro- vince of Verona.	More shocks					Colla.
— 31.	Constantinople	Another shock			Accompanied by a storm		Moniteur, 26 Nov.

1.	2.	3.	4.	5.	6.
1841. Oct. ...	Comrie in Perthshire ...	Shocks on the 5th and 23rd.			Authorities for Oct. 1839.
— Nov. 18.	Various places in the kingdom of Naples, and at Messina.	Renewed shocks			Bull. de l'Acad. de Bruxelles, t. ix. pt. 1. p. 188.
— Night between 18 and 19.	Biaritz and all along the south-west coast of France, from Bouchau to Hindaye in the department Basses-Pyrénées.	An earthquake		Occurred at the height of a terrible storm	Ditto; Moniteur, 30 Nov.; Quotidienne et Phalange, 1 Déc.; Colla.
— 20.	Dôle in the department Jura.	A severe shock			M. Perrey's Memoir on Earthquakes in France, p. 88.
—	Several places in the kingdom of Naples, and at Messina.	Renewed shocks			Bull. de l'Acad. de Bruxelles, loc. cit.
— 21.	Ditto	Ditto			Ditto.
— 27.	Smyna	A vibratory shock			Gaz. Piém. 18 Déc.
—	Comrie in Perthshire ...	Shocks were felt on Nov. 3, 5, 6, 7, 8, 18 and 26.		The shock of the 26th was pretty severe, and extended further than usual.	Authorities for Oct. 1839.
— Dec. 2.	Various places in the departments of the Rhone, Ain, Isère, Jura, and Saône-et-Loire; in Savoy, and in Switzerland. Besides those places mentioned in the other columns, the earthquake was felt at Rumilly, Annecy, Arbois, Grenoble, St. Foy-l'Argentière, Bull. near Arbrèsle, la Vavre, Beaujeu, Rosillon, Nantua, Chablons, and Maçon.	At Lons-le-Saulnier rather severe shocks at the hours mentioned. At Geneva three shocks, from S.W. to N.E., in a space of 4 or 5 secs. At Lyons a slight oscillatory shock, lasting some secs. At Vienna (Isère) it was more severe; furniture was thrown down. At Chambéry it was vibratory, and lasted 8 secs. At Belley		Preceded by remarkably hot weather. At Geneva it had rained all day, and the air was charged with electricity. At Lyons a storm accompanied the earthquake. During the motion a compass needle suddenly turned from N. to N.N.W. At Chessy and Anse il blew a storm during the night. At Belley a storm of very hot wind had blown for two days, but ceased during the night and day of the 2nd. At the fort of Pierre-Châtel most of the arms were thrown out of the racks. At St. Rambert-en-Bugey the subterranean noise resembled that of the fall of masses of rock, a frequently observed occurrence in that locality. At Seyssel a magnificent aurora had been observed the day before at 4 a.m. It was seen also at Nantua and Pont-d'Ain. The	Moniteur, 7, 8 et 11 Déc.; Journ. des Débats et Phalange, 7 et 8 Déc.; Quotidienne, 10 Déc.; Bull. de l'Acad. de Bruxelles, t. ix. pt. 1. pp. 14 et 191; Colla; Lamont's Annalen, Heft 1. S. 163; Studer; Communication of M. A. Billiet to M. Perrey; "Notes additionnelles" to M. Perrey's Memoir on Earthquakes in the Basin of the Rhone, p. 21.

to 8 P.M. are given by other authorities for this place). At Chambéry, exactly 7 <sup>h</sup> 53 <sup>m</sup> . At Chessy and Anse, 8 P.M. At St. Rambert-en-Bugey, 7 <sup>h</sup> 47 <sup>m</sup> P.M.	the direction was N. to S. At St. Rambert-en-Bugey there were three distinct shocks, diminishing in intensity, which lasted together about 10 secs. Apparent direction = E. to W. At Seyssel there were two rather severe shocks, followed in five minutes by another less distinct.	shock was particularly felt in the upper part of the Alps and in the districts of the hot springs. The springs of this kind at St. Gervais and Courmayeur were troubled the next day. Magnetic perturbations were observed on the following day at Monaco and Prague. Storms of wind and rain prevailed over France.	Colla.
1841. Dec. 2 and 3.	Rossano in Calabria		
At Chambéry, 11 P.M. At Yon and Aitemare-en-Bugey, 11 <sup>h</sup> 20 <sup>m</sup> . At Aix, Rumilly, Ancey, &c. 11 <sup>h</sup> 32 <sup>m</sup> .	In Savoy	Magnetic perturbations at Naples	Ditto; Quotidienne, 22 Déc.; Communication of M. A. Billiet to M. Perrey.
10.	Belley in the departm. de l'Ain.	Shooting stars were observed on this day at Naples, and magnetic perturbations at Nertschinsk.	"Notes additionnelles" to M. Perrey's Memoir on Earthquakes in the Basin of the Rhone, p. 23.
	Burgschloss on the Neckar, in the grand-duchy of Baden.		Lamont's Annalen, Heft 1. S. 163.
	In the Moluccas		M. Perrey's Memoir on Earthquakes in the Basin of the Rhine, p. 97.
14.	In Savoy. Also felt at Lyons, 2		Communication of M. A. Billiet to M. Perrey; "Notes additionnelles"

1.	2.	3.	4.	5.	6.
A.M. In Savoy, 2 <sup>h</sup> 30 <sup>m</sup> . 1841. Dec. 19.	Several places in the Grand Duchy of Baden.	An earthquake .....	.....	.....	to M. Perrey's Memoir on Earthquakes in the Basin of the Rhone, p. 23. Colla, Giorn. Astron. 1842.
— 20. 4 P.M.	Kintail in Ross-shire, Scotland.	A severe shock, of which there was no recurrence.	.....	Magnetic perturbations observed on this day at Cracow, Munich, Brussels, Parma, Prague, and Milan. On the 18th and 19th a remarkable fall of the barometer at Parma. During the night of 19-20 an aurora borealis at Cracow. The noise, like the rushing of water or rattling of a carriage, was very distinct. Lightning (with occasional thunder) was extremely prevalent in the west and north highlands this winter.	Edinburgh New Philosophical Journal, vol. xxxvi. p. 84.
— 21.	In the Moluccas .....	An earthquake .....	.....	.....	M. Perrey's Memoir on Earthquakes in the Basin of the Rhine, p. 98. Phalange, 1 Avril 1842.
— 25. 8 <sup>h</sup> 54 <sup>m</sup> A.M.	Nikolajewskaja, and neighbouring places, on the eastern shore of the Black Sea.	An earthquake shock, of 3 secs. duration.	.....	Accompanied by subterranean noise. Chimneys were thrown down at Anapa.	.....
— 27. 6 <sup>h</sup> 30 <sup>m</sup> A.M.	In Calabria .....	A strong shock of earthquake, lasting 15 secs.	.....	.....	Edinburgh New Philosophical Journal, vol. xxxvi. p. 372.
— 31. 10 A.M.	Pyrgos in the Peloponnesus.	A violent shock, lasting 4½ secs. Several other shocks were felt before the following morning; they seemed to come in the direction of the island of Zante.	.....	.....	Moniteur, 7 Fév. 1842.
— ...	Comrie in Perthshire ...	Shocks on the 3rd, 6th, and 7th.	.....	.....	Authorities for October 1839.
— Month and day not	Quebec in Canada .....	Several persons said they had very di-	.....	This account seems very doubtful.....	Moniteur et Phalange, 18 Juin 1841.



1842. Jan. 4. 7 <sup>h</sup> 30 <sup>m</sup> P.M.	Seebagur in Upper Assam.	enormous mass of rock fell from Cape Diamond.		The weather gloomy and cold	Quart. Journ. Geol. Soc. 1845, p. 143, quoting Journ. Asiat. Soc. of Bengal. Moniteur, 19 Janv.
— 5. 3 <sup>h</sup> 15 <sup>m</sup> A.M.	Castellane in the department. Var.	Rather a severe shock, followed about ten minutes afterwards by another similar one.			
— 10.	Kempton on the Iller, in Southern Bavaria.	A vibratory shock			Communication of M. Studer to M. Perrey.
— 14. 1 <sup>h</sup> 25 <sup>m</sup> A.M.	Biberach in Württemberg.	A shock, from S.W. to N.E., lasting several seconds, and sufficiently strong to shake windows, furniture, and all the buildings violently.		Accompanied by a noise like thunder. The barometer, between 6 and 7 A.M., stood at 26 in. 2 l. (French l.), and the thermometer at -6° R. The motion was more strongly felt in elevated situations than in low ones.	Pieninger, Jahrbuch über die Witterungs-Verhältnisse in Württemberg.
— 15. 1 <sup>h</sup> 20 <sup>m</sup> A.M.	Ditto	Another shock, vertical, and less severe than the last. Followed soon after by two undulatory shocks.		The air calm, and sky clear. Barometer at 26 in. Ditto. 5·6 l. Thermometer at -6°.	
— 16. 1 P.M.	Ditto	Another shock		This shock, like the first, was more strongly felt in the southern part of the town.	Ditto.
— 17. Between 3 and 4 (P.M.?)	Ditto	Ditto		Ditto	Ditto.
— 18. 6 <sup>h</sup> 40 <sup>m</sup> P.M.	Ditto	Ditto. At first vertical, then undulatory from N.E. to S.W.		Preceded by a noise like thunder. Barometer on this day = 26 in. 8 l. Thermometer = 0° R.	Ditto.
— 19. 0 <sup>h</sup> 50 <sup>m</sup> A.M.	Ditto	Another shock, rather severe.		There was a fall of snow on this day	Ditto.
—	Patti in Sicily	Slight shocks, which recurred on the 20th and 22nd.			Colla.

1.	2.	3.	4.	5.	6.
1842. Jan. 23. At Foligno at 5 <sup>h</sup> 15 <sup>m</sup> A.M.	Terracina, S. Angelo, Vi- cali, and Torre-di- Passeri, in the Abru- zo-Ulteriore, and Chi- eti and Lanciano, in the Abruzzo-Citeriore, kingdom of Naples. Also at Pesaro in the States of the Church, and at Foligno.	Slight shocks .....			Colla; Comptes Rendus de l'Acad. t. xv. p. 568.
— ...	... Comic in Perthshire ...	Shocks on the 2nd and 7th.			Authorities for Oct. 1839.
— Feb.	3. Pyrgos in the Peloponne- sus.	Violent shocks during a part of the day and following night. One of them lasted 4½ seconds.			L'Institut, Nr. 429.
—	5. At sea, vid. Col. 4. ....		On board the 'Nep- tune,' in 0° 57' S. lat., and 20° 47' W. long. (from Greenwich), a shock was felt, as if the ship had touched upon and were passing over a reef of coral. The motion lasted nearly a minute, and was accompanied by a dull rolling noise. The same shock was felt on board the 'Harrison,' in 0° 30' S. lat., and 21° 55' W. long. On board the 'Anna-Maria,' also, in 0° 26' S. lat.,		United Service Journal, April 1842, p. 577; Nautical Magazine, Aug. 1842; v. Leonhard's Taschenbuch, 1 Jahrgang, 1846, S. 210.

1842. Feb. 16. O.S. 7 A.M.	Tifis in Georgia.....	An oscillation in a horizontal direction.....	which?), a violent shock was felt at 5 A.M., accompanied by a rolling noise. On going upon deck the captain saw the ship trembling as if she would go to pieces, although the sea was quite calm, and the weather fine. At 5 <sup>h</sup> 50 <sup>m</sup> a slighter shock was felt, at 9 <sup>h</sup> 45 <sup>m</sup> another still slighter, and near noon one more, scarcely perceptible.	.....	.....	Memor. of M. Philadelphine on Earthquakes in the Caucasus, quoted by M. Perrey. Trans. Roy. Geol. Soc. of Cornwall, vol. v. p. 459; Communication of M. Plümminger to M. Perrey.
— 17. At Falmouth, 8 A.M.	Helston, Camborne, Redruth, and the mining districts of Cornwall. Felt at Falmouth and the neighbourhood.	.....	.....	Accompanied by a noise like thunder .....	.....	.....
— 19. 11 <sup>h</sup> 20 <sup>m</sup> A.M.	Loodianah, Peshawur, &c. in the N.W. of India. Not felt in Scinde. Extended from Jellalabad to Shalkur in Thibet on the north, and to Saharunpore on the south.	Lasted one minute, forty-seven seconds at Peshawur; one minute, thirty seconds at Loodianah, where the direction was N. to S.	.....	At Simla the smart shock disturbed all the magnets of the observatory violently, but the action on them was merely mechanical. The most destructive effects were produced in the valley of Jellalabad; the defences of Jellalabad itself, which had been repaired with extreme difficulty and toil by Sir Robert Sale's brigade, were almost destroyed, and the exertions of months were thus nullified.	.....	Asiatic Journal, N. S. vol. xxxviii. pt. 2, p. 20; Report of the British Association for 1845, p. 4; Edinburgh New Philos. Journ. vol. xxiv. p. 107.
— March 1.	Several places in the kingdom of Naples.	A shock .....	.....	.....	.....	Colla; Bull. de l'Acad. de Bruxelles, t. ix. pt. 2, p. 485.
— 4.	Bex in the Canton du Vaud, Switzerland.	Shocks.....	.....	.....	.....	"Notes Additionnelles" to M. Perrey's Memoir on Earthquakes in the Basin of the Rhone, p. 23.

1.	2.	3.	4.	5.	6.
842. Mar. 5. 9 P.M.	Delhi, Massoorie, Simla, and other places in the N.W. of India.	Very quick and violent.		The magnets of the observatory at Simla were all (mechanically) set in violent motion.	Asiatic Journal, N. S. vol. xxxviii. pt. 2, p. 17; Report of the British Association for 1845, p. 4.
— 6. About 5 <sup>h</sup> 40 <sup>m</sup> A.M.	Florence	An earthquake shock, consisting of a sudden blow, followed by undulation from E. to W. Lasted 4 seconds, and was soon after followed by two slighter shocks.		No perceptible effect on the meteorological instruments.	Bull. de l'Acad. Roy. de Bruxelles, t. ix. pt. 2, p. 485.
— 8. 2 <sup>h</sup> 7 <sup>m</sup> P.M.	Cracow	A slight tremor		The needle of the magnetometer remained perfectly stationary, and yet a suspended weight oscillated to a considerable extent. Clocks were not deranged.	Bull. de l'Acad. Roy. de Bruxelles, t. ix. pt. 1, p. 362, pt. 2, p. 146.
— 20.	Pesaro in the States of the Church.	A tremor			Quételet, Annuaire, 1844.
— 24.	Cotrone and other places in the Calabrias.	A slight shock.			Phalange, 4 et 6 Mai; Courier Français, 16 Mai.
— 30.	Different places in Greece.	Local vibrations			Comptes Rendus de l'Acad. t. xv. p. 583.
— 1 <sup>h</sup> 30 <sup>m</sup> A.M.	Bex and throughout the southern part of the Canton du Vaud, Switzerland.	A severe shock, lasting four seconds at Bex. At Sion the duration was a little greater. At Bâle several persons felt the shock, which seemed to come from beneath upwards.		Accompanied by a loud heavy noise, described at Sion as a subterranean explosion.	Bull. de l'Acad. Roy. de Bruxelles, t. ix. pt. 1, p. 292, pt. 2, p. 147; Mérian; L'Institut, Nr. 434; Colla, Notizie Meteorol. 1842, in Ann. Geograph.
— April 1.	Comrie in Perthshire ...	A single shock, on the 10th.			Authorities for Oct. 1839.
— 2.	Cotrone and other places in the Calabrias.	Three violent shocks.			Phalange, 4 et 6 Mai; Courier Français, 16 Mai.
At night.	Sargans in the canton of St. Gall, Switzerland.	Several shocks.		During a tempest	Mérian.

1842. Apr. 4. 1 <sup>h</sup> 30 <sup>m</sup> P.M.	Blida on the north coast of Africa.	A severe shock			L'Institut, Nr. 443; Journ. des Débats, 18 Avril; Siècle, 17 Avril; Phalange, 20 Avril. Authorities for the 18th.
— and 7.	6. Calamatta and several other places in Greece.	Commencement of shocks which were strongly felt on the 18th and 25th.			
— 3 <sup>h</sup> 35 <sup>m</sup> P.M.	7. Borgotaro in Tuscany.	A shock			
— 6 <sup>h</sup> 40 <sup>m</sup> A.M.	9. Ditto	Ditto			Bull. de l'Acad. Roy. de Bruxelles, t. ix. pt. 1. p. 513. Ditto.
Night between 9 and 10.	Algers	A rather violent shock, followed by two others.		Accompanied by subterranean noise	L'Institut, Nr. 443; Journ. des Débats, 18 Avril; Siècle, 17 Avril; Phalange, 20 Avril.
— 11	Cotroua in Calabria	More shocks			Phalange, 4 et 6 Mai; Courier Français, 16 Mai.
— 12.	Patras and Athens in Greece.	At Patras a shock which lasted two minutes and a half. At Athens it was less violent, and lasted but 2½ mins.			Comptes Rendus, t. xv. pp. 568 et 725; Bull. de l'Acad. de Bruxelles, t. ix. pt. 2. p. 147; National et Courier Français, 17 Mai; Moniteur et Phalange, 18 Mai.
— 6 <sup>h</sup> 17 <sup>m</sup> P.M.	Ditto, and at other places in Greece. These shocks were felt in the chain of Mount Taygetus.	At Patras a shock of less violence than that of the morning; lasted two minutes and three quarters. At Sparta the shocks lasted but 25 or 30 secs.		At Patras little damage was done, but at Calamatta and Androussa houses and churches were injured. In the province of Maina some of the inhabitants were crushed beneath the ruins.	Ditto.
— 20.	Pesaro in the States of the Church.	A slight tremor			Comptes Rendus, t. xv. p. 568.
— 3 <sup>h</sup> 55 <sup>m</sup> A.M.	25. Patras in Greece	A violent shock, lasting a minute and a half.			Authorities for the 18th.
— 7 <sup>h</sup> 15 <sup>m</sup> A.M.	28. St. Aubin, Sauge, and Vaumarcus, in the canton of Neuchâtel.	Two severe shocks, the first of which was the stronger. Apparent direction = S. to N.	The lake of Neuf- châtel, which before the shocks was quite calm, was suddenly agitated, and waves of considerable size arose from the blow itself.		Colla, Catalogue of Earthquakes in 1842, extracted from Ann. Geolog.; Mérian.

1.	2.	3.	4.	5.	6.
1842. Apr. 28. Between 1 and 2 P.M.	Grenoble .....	Rather strong oscillation.	derable height rolled in quick succession upon the shore.	On the 29th magnetic perturbations at Parma...	M. Perrey's Catalogue of Earthquakes in the Basin of the Rhine, p. 98. Authorities for Oct. 1839.
— May 7. 5 P.M.	Comrie in Perthshire ... Island of St. Domingo, especially at Cape Haytien. Extended to Jamaica, Porto- Rico, and almost all the West Indian isles.	Shocks were felt on the 21st and 22nd. Two principal shocks. The second lasted about 3 minutes, the first not so long. Another account says the shocks lasted 85 seconds. Succeeded by many slighter shocks on the 8th, 9th, and perhaps 10th. A violent shock .....	Felt on board ships in the roads.	Many houses were thrown down or injured.	Annual Register, 1842, p. 109; sev- eral French journals of June 17 and following days.
— — 21. June 3. 8 P.M.	St. Barthelemy in the island of St. Domingo. Därstetten in the Sim- menthal, canton of Berne.	A slight shock .....	.....	.....	National, 28 et 30 Juin; Phalange, 1 Juillet. Mérian; Studer.
— — 4. 1 <sup>h</sup> 30 <sup>m</sup> A.M.	Ditto .....	Another and more se- vere shock.	.....	Accompanied by noise. On the 3rd an igneous meteor was observed at Parma and in the south of France. On the 4th, magnetic per- turbations at Brussels, and on the 4th and 5th at Munich and Prague.	Ditto.
— — 15.	Eggeseth or Egeyst in the Søndmør, Norway.	A shock of earthquake	.....	.....	Bull. de l'Acad. de Bruxelles, t. ix. pt. 2. p. 485.
— — 21.	In Lancashire .....	Ditto .....	.....	.....	Ditto.
— — 24. 5 <sup>h</sup> 30 <sup>m</sup> A.M.	Island of St. Domingo...	Very severe shocks ...	.....	.....	Quotidienne, 11 Août et 2 Sept.; Colla, Notizie Meteorol. p. 17.
— — 28.	Islands of Grenada, An- tigua, and St. Kitt's.	.....	.....	.....	Ditto.
— — —	Leipzig .....	Shocks .....	.....	.....	Pieninger, Jahrsbericht über die Witterungs-Verhältnisse in Wür-

— In the first half of the year.	Ponce (in the island of Porto-Rico?), 1500 miles east of Saint-Martinville, Louisiana.	2nd, and 8th.	on the 8th to the extent of rather more than half an inch.
— July 3. 4 <sup>h</sup> 45 <sup>m</sup> A.M.	St. Jean-de-Maurienne in Savoy.	Three slight shocks.	Why the position of this place should be fixed with reference to another 1500 miles distant does not appear, unless the shock were felt at Saint Martinville.
— 5 A.M.	8. Campoli in the kingdom of Naples.	A slight undulatory shock.	
Between 11 <sup>h</sup> and noon.	10. Dunblane in Scotland.	A shock from S.W. to S.E. (?)	
4 <sup>h</sup> 20 <sup>m</sup> P.M.	12. Calamatta and Sparta, in Greece.	A slight tremor	
— 13.	In Norway		
— About 7 <sup>h</sup> 30 <sup>m</sup> P.M.	31. Gross-Kanisch in Hungary.	An earthquake	
— Aug. 3. 2 <sup>h</sup> 8 <sup>m</sup> A.M.	Island of Martinique	Shocks were felt on the 1st and 10th. A shock lasting about two seconds. They were often felt about this time, especially at night.	
— 8.	Island of Guadeloupe, at Pointe-à-Pitre.	Very distinct shocks.	
— About 8 P.M.	19. Pitchoy, between Dunkeld and Blair, Scotland.	Three shocks	
— According to Prof. Kreil, between 6 and 7 P.M.:	22. In North Wales. Extended through the whole of Angles, especially the southern portion. Said	A shock	

Moniteur, 26 Juin.

"Notes additionnelles" to M. Perrey's Memoir on Earthquakes in the Basin of the Rhone, p. 24. Bull. de l'Acad. Roy. de Bruxelles, t. ix. pt. 2. p. 485.

Perhaps this earthquake belongs only to the series of Comrie shocks.

Courier Français, 26 Août.

Quêtelet, Ann. de l'Observ. de Bruxelles, 1844, p. 309. Bull. de l'Acad. Roy. de Bruxelles, t. ix. pt. 2. p. 485.

Authorities for Oct. 1839.

National, 19 Sept.; Echo de la Haute Marne, 22 Sept.; Colla, Notizie Meteorol. p. 18.

Colla, *loc. cit.*; Institut, Nr. 458.

Report of the British Association for 1843, p. 121.

Ditto; Prof. Kreil in Bull. de l'Acad. Roy. de Bruxelles. t. ix. pt. 2. p. 485.

The night was warm and sultry with a drizzling rain. At midnight the thermometer stood at the unusual height of 72°.

1.	2.	3.	4.	5.	6.
and at Prague, at 8 <sup>h</sup> 15 <sup>m</sup> p.m.	by Prof. Kreil to have been perceived at Prague by its effect on the self-registering barometer and thermometer, which, he observes, are sensible to the smallest shock.				
1842 Aug. 26. In the evening.	Catanzaro in Calabria ...	A very distinct undulatory shock.			Colla.
— — — — —	Comrie in Perthshire ...	A single shock on the 27th.			Authorities for Oct. 1839.
— Sept. 6. — — — — —	Island of Jamaica ...	A slight shock.			Colla, Notizie Meteorol. p. 18.
— — — — —	9. Gross-Kanischka in the county of Szalad, Hungary. Felt within a circle of six or eight leagues in radius.	Four shocks at intervals of fifteen or twenty minutes.			Colla, Notizie Meteorol. p. 18. Several houses were injured and all the glass of Phalange, 5 Oct. broken.
— — — — —	12. Patras and Athens, Greece.	A severe shock			Quotidienne, 3 Oct.
— — — — —	Comrie in Perthshire ...	Shocks on the 2nd, 24th, and 25th.			Authorities for Oct. 1839.
— Oct. 2. — — — — —	Girgenti in Sicily ...	A shock			Colla.
Night between 6 & 7.	Dinan in the departm. Calvados.	A shock of 2 secs. duration. The apparent direction of the oscillation was E. to W.			Accompanied by a hollow sound, which some persons took for a clap of thunder; but the sky was perfectly free from clouds, and the noise came distinctly from beneath upwards.
— — — — —	9. Baroda, north of Bombay, Hindostan.				Asiatic Journal, N. S. vol. xxxix. pt. 2, p. 409.
— — — — —	13. Coblenz and Neuwied on the Rhine.	At Coblenz, two shocks. At Neuwied the motion lasted six seconds.			Accompanied at Coblenz by a loud noise. At Neuwied "the devil's house and devil's kitchen" experienced shocks. The air was calm, the temperature mild, and the sky covered with clouds. On the 12th an igneous meteor



1842. Oct. 24. 8 <sup>h</sup> 5 <sup>m</sup> A.M. or 8 <sup>h</sup> 11 <sup>m</sup> P.M.	At Algiers	A rather severe shock, from W. to E., lasting some seconds.	was seen in the departm. Ière, on the 12th and 13th great variations in the state of the barometer were observed at Parma, on the 13th magnetic perturbations at Parma, and on the 13th and 14th at Prague, and 14th at Naples and Brussels.	Globe, 3 Nov.; Phalange, 4 Nov.
— 25. 0 <sup>h</sup> 15 <sup>m</sup> P.M.	Tivoli, in the States of the Church.	A slight shock, apparently undulatory, from E. to W.	Accompanied by a rolling noise like that of thunder among the mountains. Caused much alarm, especially among the Spaniards.	Phalange, 15 Nov.
— 29. 8 P.M.	Seesagar in Upper Assam.	Tremulous motion, apparently from S.W. to N.E.		Quart. Journ. Geol. Soc. 1845, p. 143, quoting Journ. Asiat. Soc. of Bengal.
— Nov. 1. About 7 <sup>h</sup> 15 <sup>m</sup> P.M.	At Algiers	A strong oscillation, followed almost immediately by another of greater violence.		Gaz. de Milan, 20 Nov.; Communication of M. Colla to M. Perrey.
— 8. Between 8 and 9 A.M.	Montreal, La Chine, Trois-Rivières, and other places in Canada.	Terrible shocks	The waters of the St. Lawrence were violently agitated.	Moniteur, 5 Déc.; Report of the British Association for 1845 (Trans. of the Sect.), p. 20.
— 9. 10 <sup>h</sup> 15 <sup>m</sup> A.M.	Belpasso and all the southern side of Etna.	A very distinct shock.	Some houses were thrown down. The next day a kind of volcanic dust covered the roofs, plants, &c. in Naples, Pozzuoli, Ischia, and all the south-western part of the kingdom.	Gaz. de France, Moniteur National, et Courier Français, 17 et 18 Déc.; Phalange, 6 Janv.; Majocchi, Annali di Fisica, t. vii. p. 274; Colla.
— 13.	Nantes, France	A shock	Accompanied by two explosions	Moniteur, 17 Nov.; Bull. de l'Acad. Roy. de Bruxelles, t. x. Nr. 2, p. 16. Mérian; Studer.
— 21.	Several localities in the canton of Neuchâtel. Vauxmains and St. Aubin are mentioned.	Slight shocks		
— 25.	Several places in the kingdom of Naples. And, the same day, some shocks at Catania.	Three severe shocks, the two first being sudden jerks or blows, and the third undulatory. Total duration = 9 secs.	Some days before, a globe of fire had been seen in the Abruzzo, moving from E. to W.	Authorities for the 9th.

1.	2.	3.	4.	5.	6.
1842. Nov. 27.	Nicosia and other places near.	Shocks.....	.....	Followed by an eruption of Etna.....	Authorities for the 9th.
— 29.	In the Commune of Pasla, Calabria Citeriore.	A severe shock.....	.....	.....	Ditto.
About 2 A.M.	.....	.....	.....	.....	.....
— 30.	Comrie in Perthshire....	Shocks felt on the 18th and 29th.	.....	.....	Authorities for Oct. 1839.
— Dec. 4.	At Algiers.....	A severe shock, consisting of repeated undulations to and fro.	.....	Some houses were injured. Many persons were made ill by the undulatory motion.	Gazette de France, et Courier Français, 16 Déc.
About 3 A.M.	.....	.....	.....	.....	.....
— 5.	Aquila in the kingdom of Naples.	A severe undulatory shock.	.....	.....	Moniteur et National, 7 Janv. 1843.
6 A.M.	On the side of Etna, at Nicolosi, &c.	A slight shock.....	.....	In the midst of loud explosions, during an eruption of the volcano.	Majocchi, Annali di Fisica, t. vii. p. 276.
2 P.M.	Potenza in the Basilicata, kingdom of Naples.	A vibratory shock.....	.....	No damage done.....	Gazette de France, et Courier Français, 18 Janv. 1843.
3 <sup>h</sup> 45 <sup>m</sup> P.M.	.....	.....	.....	.....	.....
— 27.	In Dalmatia.....	Very many shocks felt between this date and Feb. 11, 1843.	.....	.....	Bull. de l'Acad. Roy. de Bruxelles, t. x. pt. 2. p. 15.
— 28.	Comrie in Perthshire....	Shocks on the 4th and 17th.	.....	The shocks on the 17th were felt only at Zomperran, half a mile east of Comrie.	Authorities for Oct. 1839.
— 29.	Zetela, near the mountains of Puebla, Mexico.	An earthquake.....	.....	Accompanied by an eruption of flame, &c. from To-Ecano.	Moniteur, 20 Déc., under news from Mexico of 20 Nov.

The foregoing Catalogue raisonnée, thus completed to the end of the year 1842, was originally proposed to have been extended in the same form, to the end of the year 1850. The discussed annual Catalogues published by Professor Perrey, of Dijon, which commence with the year 1843, were found so complete, after the collation of a considerable term of their epoch with other documents, that it appeared a waste of labour to continue the British Association Catalogue, in its tabular form, through the remaining eight years. This Catalogue therefore here closes, but the discussion for the elements of space and time, now to follow, will embrace its whole period and up to the end of 1850; and will be derived as respects the concluding years from the Catalogues of Monsiense, Deccese, a complete list of which will be given

FOURTH REPORT  
UPON  
THE FACTS AND THEORY  
OF  
EARTHQUAKE PHENOMENA.

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THE present, Fourth, and probably last Report on Earthquakes that I shall have the honour of presenting to the British Association, has for its objects the discussion of the great catalogue of earthquakes printed in several preceding volumes of its 'Transactions,' the last portion of which only appeared in type in 1855, and the completion, as far as possible, of the complement of the other desiderata mentioned at the conclusion of the First Report (1850). The pressure of other occupations, with some uncontrollable circumstances, have delayed for nearly three years its appearance: the delay, however, has not been without advantage; it has enabled me more fully to grasp additional conditions and difficulties, before unnoticed, of some branches of the subject, and to derive advantage from the contemporaneous labours of the few physicists who are engaged in Seismology; foremost amongst whom stands M. Perrey of Dijon.

The reader will with advantage refer to the conclusions of the Second Report (1851), as to the construction of the catalogue which constitutes the Third (1854), before perusing the present; as well as to the concluding note of that Report, in which it is stated that the catalogue commencing at 1606 B.C., and originally proposed to be extended in its tabular form to the end of 1850 A.D., was concluded at the end of the year 1842, from which period up to 1850, and indeed later still, the catalogues of Prof. Perrey supply all that is needful, though it is to be regretted that they are not tabulated for more convenient reference. But although the British Association *Catalogue* concludes with 1842, the *discussion of facts* has been extended to the end of 1850, the base of induction for the last eight years being supported by the labours of Perrey.

The whole base of induction therefore for such conclusions as are here to be attempted,—embracing between 6000 and 7000 separate recorded earthquakes over every known part of the globe, both on land and ocean,—the character of the facts given,—their scantiness as to information of scientific value,—the methods, or rather the want of all method, in their observation, and other causes, mentioned in the Second Report,—I think justify me in stating my conviction, that nearly all that can be drawn from the collection and discussion of such records has now been done, and that the labour of collecting and calculating further and future *Seismologies* will be in a great degree thrown away, unless the cultivators of science of all countries,—in conjunction with the scientific bodies and the scientific departments of the chief civilized governments of the world,—shall unite in agreeing to some one uniform system of seismic observation, and record and transmit the results

B

periodically to a central *bureau* for discussion. What has been done for astronomy and for terrestrial magnetism, is beginning to be done for meteorology, and through the suggestive labours of Maury, Bache, and others, for maritime discovery, ought to be done now for seismology, whose chief requirements could be readily added to those already supposed to be systematized from Lieut. Maury's proposals, as well as to those long in course in the astronomical, magnetic, and meteorological observatories of the world. The spread of the net of telegraphic wires rapidly over the whole earth offers facilities for the observation of earthquake phenomena, in which time always enters as so important an element, never before possessed. We shall revert to this in treating of seismometry.

Before proceeding to the discussion of the British Association Catalogue, I propose giving some account, in a connected form, of the discussions by Professor Perrey, of his own local or partial catalogues, and of the conclusions he has thence drawn; as well as referring to some minor catalogues, more or less completely discussed by their authors: amongst the latter, Mr. Milne's valuable contributions escaped my notice when preparing my first report. Perrey's labours in generalizing (as far, perhaps, as can from the data be safely done) the facts of several great seismic kingdoms, and announcing their results, form a valuable prelude to the still larger base of generalization finally here discussed, and extending to the whole known globe. The *discussed* catalogue memoirs of Perrey, to which I have had access, apply to the following localities:—

In the European Hemisphere—

The Scandinavian Peninsula and Iceland.  
 The British Islands.  
 The Spanish Peninsula.  
 France, Belgium, and Holland.  
 The Basin of the Rhone.  
 The Basin of the Rhine.  
 The Basin of the Danube.  
 The Italian Peninsula.  
 Algeria and Northern Africa.  
 The Turco-Hellenic Peninsula, with Syria.

And in the American Hemisphere—

The Basin of the Atlantic.  
 Canada and the United States.  
 Mexico and Central America.  
 The Antilles.  
 Chili and La Plata.  
 Cuba, by M. Poey.

In addition to which, Perrey has combined and discussed together—

Europe, with the adjacent regions of Africa and of Asia.  
 The North of Europe and of Asia—

viewing the three continents in the light of two parallel Austral and Boreal zones.

The general method adopted by Perrey has been, after an introductory physico-geographical sketch of the region, and the catalogue itself of earthquakes, to discuss them numerically and graphically.

In time { Numerically and  
           { relatively . . . . { By centuries { Seasons, months,  
                                   { By years .. { days.

Occasionally also with reference to lunations.

In space { With reference to direction,  
i. e. horizontal direction, of  
shock. } With reference to sup-  
posed derivative or  
mean horizontal direc-  
tion of shock.

And lastly, as to relative intensity, or dynamic value of the shock in each direction, which he arrives at on the assumption that this, in any given rhumb, is proportional to the *number* of shocks observed in its direction in a given period, a supposition which—although perhaps not without some value, as admitting of one mode of regarding the relations of distant seismic regions not otherwise possible—admits of the gravest doubt whether it have any real natural basis.

We shall consider the results in the order above. Near as Norway and Sweden are topographically to the British Islands, it is not with these, but with Iceland and the intervening band of the Northern Ocean that the Scandinavian peninsula is in connexion as a seismic region; very few examples occur of simultaneous action between the former; but seldom has there been any marked convulsion in Iceland without commotion in Norway, &c., and *vice versa*. Scandinavia itself, one of the most remarkable masses of land in slow process of elevation in the world, also shows its connexion with internal action; and were it not that Iceland is pierced with numberless vents, broken and shattered in every direction by volcanic action, that admits of no cessation or consolidation above, there can be no doubt that the destructive power of earthquakes would be manifested in the northern peninsula to a far more serious extent and intensity.

That Greenland, at least the east coast, and the Faröe Islands are shaken frequently, is highly probable, though I am not aware of any such record.

The following is the result of Perrey's chronology of this region:—

TABLE I.—Earthquakes of Scandinavian Peninsula and Iceland.

Century A. D.	With dates of month or day.												Of Season.	Of Year	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter.	Summer.	
XII. to XVII.	3	2	1	1	2	...	...	...	...	...	...	...	...	...	19
XVIII. ....	13	7	9	5	7	4	9	5	8	7	8	11	2	3	13
XIX. ....	17	11	11	7	7	6	8	8	10	10	11	6	...	1	...
Totals .....	33	20	21	13	16	10	17	13	18	17	19	17	2	4	32
	Winter 74			Spring 39			Summer 48			Autumn 53					

On examining this Table, Perrey remarks the same preponderance of earthquakes in the winter half of the year, that is evident from many of his other calculations for various regions. Here, for the six months of winter, there are 129 shocks, and but 91 for the summer half year.

Perrey is also of opinion, from the general result of his researches, that there is a preponderance of shocks at the equinoxes and summer solstice, which he denominates the "Critical Epochs" of the year. It is so for Scandinavia.

The total number of earthquakes given with dates is 252, representing by twelve the mean annual number. He tabulates the proportional number for each month thus:—

TABLE II.—Scandinavia. Relative frequency throughout the year.

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Proportional number.
1·85	1·12	1·18	0·75	0·90	0·56	0·95	0·75	1·01	0·95	1·06	0·95	= 12

Winter .....	1·38
Spring .....	0·73
Summer .....	0·90
Autumn .....	0·99

And at the two months of each solstice and equinox—

March and April .....	0·94
June and July .....	0·74
September and October .....	0·95
December and January .....	1·36

As to general direction of the *observed or horizontal element* of shock—it has in most instances traversed a line, with more or less divergence, stretching away from Iceland; and there can be little doubt that this is the real line of propagation of the original pulses.

Perrey, however, conceives that a mean or chief resultant direction of shock for each given seismic region may be calculated in the following way. Taking the mean frequency of shock = 1, he finds for the eight principal rhumbs proportional numbers, as for example in the present case:—

TABLE III.

Rhumb, or direction of shock.	Relative frequency in direction.
N. to S. ....	0·73
N.E. „ S.W. ....	1·09
E. „ W. ....	0·73
S.E. „ N.W. ....	1·09
S. „ N. ....	1·09
S.W. „ N.E. ....	1·45
W. „ E. ....	1·09
N.W. „ S.E. ....	0·73

Then, considering the cause of movement in any given direction to be proportional in intensity to the number of times that it has acted in each observed direction, viz. as proportional to the preceding numbers, he treats these as the forces themselves given in magnitude and in direction, and compounds them for a single resultant according to Lambert's formula.

This process gives for Scandinavia a general resultant direction of propagation of S. 22° 30' W., and with an intensity or force represented by 0·94.

If we study this presumed direction with the Mercator chart before us, we find that the line is not very wide of that forming the general length of

the great Scandinavian chain, and is in fact nearly a normal to the actually observed directions of shock.

It is a fact observed in many other seismic mountain chains, as well as along the lines of great valleys and river-courses, that the main directions of propagation of shock are along the lengths of the chains, valleys or river-courses; and a very obvious explanation why this should *frequently* be the case suggests itself, namely, that the solid materials of the earth are less shattered and discontinuous, and more homogeneous in these directions than in those transverse to the ranges and valleys, &c.; but how far this is in any way connected in nature with Perrey's conclusion admits still of doubt; and indeed it is manifest that any attempt to calculate a general or mean resultant, from the horizontal component of shock *only*, must be at least incomplete, and, from other reasons that will be given when treating of seismometric instruments, may be said to be at present impossible. I should by no means wish, however, altogether to reject this ingenious method of discussion in the present state of our knowledge.

Perrey's results are subjoined for—

TABLE IV.—Earthquakes of the British Islands and Northern Isles.

Century.	Earthquakes with date of month.												Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
XI. ...	...	...	2	2	1	...	...	1	...	...	1	...	8
XII. ...	1	...	...	1	...	...	...	1	2	...	...	2	11
XIII. ...	2	1	...	...	1	1	...	...	1	...	...	2	15
XIV. ...	...	...	...	...	1	...	1	...	...	...	1	...	4
XV. ...	...	...	...	...	...	...	...	...	1	...	...	...	1
XVI. ...	1	2	...	1	2	...	...	1	...	...	...	1	8
XVII. ...	3	...	...	...	...	1	...	...	2	3	1	2	14
XVIII. ...	5	4	7	5	3	2	3	5	6	6	8	8	63
XIX. ...	9	9	10	7	8	6	5	11	12	8	11	12	110
Totals.	21	16	19	16	16	10	9	19	24	17	22	28	234
	Winter 56			Spring 42			Summer 52			Autumn 67			

The number occurring in spring and summer together is but three-fourths that of autumn and winter united, the relative number for the four seasons being—

Winter	1.03
Spring	0.76
Summer	0.96
Autumn	1.24

And the two months of the critical epochs—

Winter solstice	1.28
Spring equinox	0.96
Summer solstice	0.53
Autumnal equinox	1.13

The relative numbers as to horizontal direction :—

S.	to N.	.....	0·48
N.E.	„ S.W.	.....	0·48
E.	„ W.	.....	1·70
S.E.	„ N.W.	.....	0·73
S.	„ N.	.....	0·73
S.W.	„ N.E.	.....	1·46
W.	„ E.	.....	1·46
N.W.	„ S.E.	.....	0·97

from which, by the preceding method, Perrey computes a mean horizontal direction of

S.  $39^{\circ} 5'$  W. to N.  $39^{\circ} 5'$  E.,

which is about the line of direction of Loch Ness and of the Caledonian Canal.

This is certainly, however, not the general or mean horizontal direction of British earthquakes, which appears to be one from south to north, veering more or less to the east or west, but having on the whole a direction passing through the probable focus of the Lisbon earthquakes and of the Canary Islands. I am not aware that any attempt has been made to ascertain the angle of emergence of the wave of shock for any British station, except indirectly by myself, in my "Memoir on the British Earthquake of November 1852" (Trans. Roy. Irish Acad. vol. xxii. part 1) at Dublin, which was from  $25^{\circ}$  to  $30^{\circ}$  inclined to the horizon; and assuming the origin to have been even somewhere *between* Great Britain and Lisbon, the depth of focus must have been very great; that earthquake extended over the greater portion of the British Islands, the maximum disturbance on the surface being about Shropshire.

Mr. David Milne, in one of a series of very able papers on British earthquakes in the 'Edinburgh Philosophical Journal,' vols. xxxi.—xxxvi., which I regret not having noticed in my Second Report as prominently as they deserve, expresses his conviction (as it appears to me, however, from very insufficient grounds) that all British earthquakes have had an origin of disturbance immediately beneath Great Britain, and not at some distant point beyond, his chief reasons being, 1, that with few exceptions they affected only certain portions of the island; 2, that there was in all the districts affected some spot where the concussion and attendant noise were greater than anywhere else, and that they diminished with their distance from this spot; 3, that the shock and the noise moved simultaneously from this spot.

A reference to the Catalogue will show that these are by no means the general prevailing facts; and if they had been so, they do not prove the point, for reasons to be gathered from the Second Report. In the absence of any knowledge of the angle of emergence, it is a very incomplete statement of fact when Milne says, that "out of 110 shocks recorded in England, 31 *originated* in Wales, 31 along the south coast of England, 14 on the borders of Yorkshire and Derbyshire, and 5 or 6 in Cumberland." "These facts," he adds, "seem to show that the seat of action cannot be very far down in the earth's interior." Locally variable surface-disturbance, and even none at certain localities, within large areas exposed to seismic action, are amongst the most common phenomena of observed earthquakes even of the greatest extent and intensity, and arise, amongst other reasons, from the heterogeneous and dis-located materials of the earth's crust perturbing the



elastic wave. A considerable number of shocks, recorded in Scotland, have been stated to have had a horizontal direction more or less from west to east; and this is by no means incompatible with the general prevalent direction from south to north already mentioned; nor has it been unnoticed elsewhere, that long ranges of hills of hard elastic rocks, with deep intervening valleys, change the general horizontal course of the wave of shock reaching their flanks into one mainly felt along the line of the chain. The little shocks for long periods almost continuously felt in and about Comrie in Scotland, have all had a general direction from west to east; but these, like the similar phenomena long carefully observed by Prof. Merian at Basle in Switzerland, those at East Haddam in Massachusetts and elsewhere, I omit from consideration here, as very doubtfully belonging to the class of earthquakes proper at all, and perhaps no more than tremors, more or less forcible at the surface, due to the fracturing of rocky masses below, by the gradual processes of elevation or depression of the land. Excluding these, our records, so far as they go, point to the south-to-north general direction as given.

Milne has discussed, with reference to period of the year, the circumstances of 139 Scottish and 116 English earthquakes; and the result squares pretty closely with Perrey's.

The following is Milne's Table:—

TABLE V.

	Scotland.	England.	Total.
January.....	14	11	74. Winter months.
February .....	14	13	
March .....	12	10	
April.....	9	10	44. Spring months.
May .....	8	4	
June .....	4	9	
July .....	5	5	58. Summer months.
August .....	12	9	
September .....	12	15	
October .....	14	11	79. Autumn months.
November.....	20	12	
December.....	15	7	
	139	116	

He notices also the fact, which we shall find has not escaped Perrey ('Memoir on France'), that the period of the year at which seismic action appears to be greatest, is that when both the actual height of the barometric column is the minimum, and the range of its oscillations the greatest in the year; and he has put with clearness the enormous total effect in the increase or diminution of pressure over large areas, due to such changes in atmospheric pressure, as a possible (he deems a certainly) connected cause in the production of earthquakes.

Proceeding now to the Spanish Peninsula, comprehending all west of the Pyrenees and the ocean washing the shores of Portugal, the following are Perrey's results:—

TABLE VI.—Earthquakes of the Spanish Peninsula.

Century.	Earthquakes with date of day or month.												With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
XI. ...	...	...	...	...	...	...	...	...	...	...	...	...	3	3
XII. ...	1	1	...	1	...	...	...	...	...	...	...	...	1	4
XIII. ...	...	...	...	...	...	...	...	...	...	...	1	...	2	3
XIV. ...	1	...	3	...	1	...	...	...	...	...	...	...	3	8
XV. ...	...	...	...	1	...	...	...	...	...	...	...	...	3	4
XVI. ...	2	...	...	1	...	...	3	...	...	1	...	...	3	10
XVII. ...	...	...	...	...	...	2	...	2	1	2	1	1	1	10
XVIII. ...	11	8	7	8	4	6	5	9	2	9	13	8	3	93
XIX. ...	10	5	6	7	4	6	10	5	9	11	7	5	...	85
Total.	25	14	16	18	9	14	18	16	12	23	22	14	19	220
	Winter 55			Spring 41			Summer 46			Autumn 59				

Taking the mean monthly frequency = 1, the relative monthly frequency, and that according to season, are as follows:—

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1·49	0·84	0·95	1·07	0·54	0·84	1·07	0·95	0·71	1·37	1·31	0·84
Winter 1·09			Spring 0·82			Summer 0·91			Autumn 1·17		

or in autumn and winter together, 114 earthquakes against 87 in the spring and summer.

As respects observed horizontal directions, the ratios were—

N.	to S.	0·38
N.E.	„ S.W.	0·76
E.	„ W.	2·67
S.E.	„ N.W.	0·76
S.	„ N.	1·91
S.W.	„ N.E.	0·38
W.	„ E.	0·76
N.W.	„ S.E.	0·38

which, by the method of calculation already given as adopted by Perrey, gives for the mean horizontal direction—

E. 31° 56' S. to W. 31° 56' N.

This deduction appears to agree tolerably well with the actually recorded directions of shocks in Portugal and Spain, whose focus seems to be beneath the sea, between Lisbon and the Azores, all of which, as well perhaps as the Canaries, are connected as one seismic region. Perrey states, that in the Pyrenean chain, taken *separately*, not only is the preponderance of seismic

action in the winter reversed, so that shocks are more frequent in summer than in winter, and those in summer and spring together are to those in autumn and winter as 2 to 3, but the observed horizontal direction is different, being most usual in the main line of the chain.

If this be so, it would either be explicable as a case of deflected wave, like that already mentioned with regard to the general north and south line in Great Britain, becoming a south-west and north-east one in Scotland, the angle of deflection in the present instance being small; or it would indicate that some of the shocks of the Pyrenees have connexion with the Mediterranean seismic region.

Spain, including Portugal, in its external configuration, with its vast table-land of the two Castiles, rising nearly 2000 feet above the sea, is perhaps the most interesting portion of Europe, not only in this respect, but as a region of earthquake disturbance, where the energy and destroying power of this agency have been more than once displayed upon the most tremendous scale.

It may be worth while to place here the tables of the progression of the shocks of the two great Lisbon earthquakes of 1755 and 1761, as collected by Milne (Edinburgh Phil. Journ. vol. xxxi.) from various sources, although the chief result has been already discussed in the Second Report. The time given in the Tables is reduced to Lisbon time; the distances in degrees of seventy miles English each.

Progressive rate of the shock, Lisbon earthquake of 1st November, 1755.

Localities.	Moment observed of shock.	Distance from presumed origin.	Time from impulse to arrival.	Observations.
Presumed focus, lat. $30^{\circ}$ , long. $11^{\circ}$ W. ....	h m 9 23	° ' ...	m s ...	At sea.
A ship at sea, in lat. $38^{\circ}$ , long. $10^{\circ} 47'$ W. ....	9 24	0 30	1 0	
Colares .....	9 30	1 30	7 0	Portugal.
Lisbon .....	9 32	1 30	9 0	
Oporto .....	9 38	2 30	15 0	
Ayamonte .....	9 50	4 0	27 0	Spain.
Cadiz .....	9 48	5 0	25 0	
Tangier and Tetuan .....	9 46	5 30	23 0	
Madrid .....	9 43	6 0	20 0	
Gibraltar .....	9 55	6 0	32 0	
Funchal .....	10 1	8 30	38 0	Madeira.
Portsmouth .....	10 3	12 30	40 0	
Havre .....	10 23	13 0	60 0	
Reading .....	10 27	13 30	64 0	
Yarmouth .....	10 42	15 0	79 0	[certain.]
Eyam Edge .....	10 30	15 30	67 0	Derbyshire (not
Durham .....	9 58	17 0	35 0	Uncertain.
Amsterdam .....	10 6	17 0	43 0	
Loch Ness .....	10 42	18 0	79 0	
Hamburgh .....	11 43	20 0	140 0	Uncertain.

Much uncertainty attends many of the statements as to time; and at several localities there is evidence that the shocks arrived much more rapidly than at others, in relation to distance. Thus at Cork two shocks were felt at  $9^h 33^m$ .

The longitudes are from the meridian of Greenwich.

## Progressive rate of the shock, Lisbon earthquake of 31st March, 1761.

Locality.	Moment observed of shock.	Distance from presumed origin.	Time from impulse to arrival.	Observations.
Presumed focus, lat. 43°, long. 11° W. ....	h m 11 51	° ' ...	m s ...	At sea.
Ship at sea, in lat. 43°, not many leagues from coast of Portugal .....	11 52	0 30	1 0	
Ship in lat. 44°, and about 80 leagues off coast .....	11 54	1 45	3 0	
Corunna .....	11 51	2 30	6 0	
Ship lat. 44° 8', and 80 leagues W.N.W. of Cape Finisterre .....	11 58	3 30	7 0	
Lisbon .....	noon	4 30	9 0	Uncertain.
Madeira .....	12 6	10 0	15 0	
Cork .....	12 11	9 30	20 0	
Loch Ness, between .....	{ 11 40 and 12 40 1 15 }	11 0	{ 20 0 and 49 0 84 0 }	
Amsterdam, between .....	{ and 1 45 }	15 15	{ and 114 0 }	

The great sea-wave of the shock of 1755 appears, from the recorded periods of arrival, to have travelled from its point of origin to the following places at the rates given in miles English per minute, according to Milne: assuming the transit rate uniform for the whole range of translation, which, however, is not possible:—

Plymouth .....	2·1 miles per minute.
Kinsale .....	2·7 "
Mount's Bay .....	2·7 "
Cadiz .....	3·6 "
Funchal .....	3·7 "
Ayamento .....	5·0 "
Lisbon .....	5·5 "
Antigua .....	6·0 "
Barbadoes .....	7·3 "

and that of the shock of 1761, as follows:—

Scilly Isles and Mount's Bay ....	2·0 miles per minute.
Dublin .....	2·1 "
Kinsale .....	2·7 "
Barbadoes .....	7·4 "

I place these results of Milne's discussions of the imperfect materials at his command, rather for convenience of reference to future investigators than as attaching much value to them beyond rude and provisional approximations\*.

\* For the same reasons I transcribe the following notice, which has appeared while these sheets have been printing:—

"Direction and velocity of the earthquake in California of the 8th and 9th January 1857 By Dr. John B. Trask." Silliman's Journal, Jan. 1858, vol. xxv. p. 146.

"The precise time of one of the shocks was obtained with tolerable accuracy for five

We proceed now to France, Belgium, and Holland, the limits of which Perrey fixes somewhat arbitrarily, as bounded on the south by the Mediterranean and by Spain, on the west and north by the Atlantic and Northern Oceans, as far as the Zuyder Zee, on the east by the Rhine and Alps, but comprising within it Geneva, in the basin of the Rhone, and Basle, Manheim, Frankfort-on-the-Main, and some other cities close to the right bank and in the basin of the Rhine.

TABLE VII.—Earthquakes of France, Belgium, and Holland.

Century.	Earthquakes with date of Day or Month.												With date of Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter and Autumn.	Spring and Summer.		
IV. ....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
V. ....	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1
VI. ....	...	...	...	1	...	1	...	...	...	...	...	1	...	...	3	6
VII. ....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
VIII. ....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
IX. ....	4	2	1	2	...	...	...	...	3	1	...	4	3	...	1	21
X. ....	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2
XI. ....	...	1	2	...	2	...	2	...	1	3	2	1	...	...	2	16
XII. ....	3	...	1	2	2	1	...	1	...	...	...	1	...	...	1	12
XIII. ....	1	1	1	...	...	1	1	...	1	...	1	...	...	...	2	9
XIV. ....	1	1	1	1	2	1	1	...	2	1	2	1	1	1	6	21
XV. ....	...	1	...	2	...	1	1	2	1	...	3	1	...	1	1	14
XVI. ....	7	6	5	4	5	2	3	2	6	4	2	5	3	...	7	61
XVII. ....	13	15	4	4	7	3	7	3	8	4	6	11	...	...	6	91
XVIII. ....	26	20	17	26	11	18	17	15	13	18	23	28	1	...	4	237
XIX. ....	27	17	21	13	13	8	15	17	15	17	21	25	1	...	1	211
Total. ....	83	64	53	55	42	36	47	40	50	48	60	78	9	2	35	702
	Winter 200.		Spring 133.		Summer 137.		Autumn 186.									

localities eastward of San Francisco, the greatest error in time of the clocks being 3' 4'', and the least 0' 22''. The time, being all reduced to that of San Francisco, gives the following results:—

Locality.	Lat.	Long.	Time of shock.	Elapsed time.	Velocity per min.
	° /	° /	h. m. s.	m. s.	miles.
San Francisco .....	37 48	122 25	8 13 30	0 00	0·0
Sacramento .....	38 39	121 23	8 20 00	7 30	6·6
Stockton .....	37 52	121 34	8 23 00	9 30	6·5
Tejon .....	35 00	118 46	8 45 00	32 30	6·0
San Diego .....	32 42	117 13	8 50 00	36 30	7·0

or, for the average of the five observations, 6·2 miles per minute, or 545·6 feet per second. The author says, this closely approximates to Prof. Bache's results as to the rate of the earthquake at Limoda on 23rd December 1854 (Amer. Asa. for Advancement of Science, for that year); but he appears here to confound rate of sea-wave with that of earth-wave or shock."

And for the two months at each critical period of the year—

Dec. and Jan.,	Winter Solstice .....	161
June and July,	Summer ditto .....	83
March and April,	Spring Equinox.....	108
Sept. and Oct.,	Autumnal ditto .....	98

As respects horizontal direction, the relative numbers are,—

N.	to S.	1.50
N.E.	„ S.W.	0.43
E.	„ W.	1.88
S.E.	„ N.W.	0.59
S.	„ N.	1.02
S.W.	„ N.E.	0.96
W.	„ E.	0.91
N.W.	„ S.E.	0.69

which, by Perrey's method of calculation, gives for the mean general horizontal direction,—

N. 71° 27' E. to S. 71° 27' W.

To this he not only, in the case of France, confesses that he does not attach much weight, but also states that each century will not give the same mean resultant.

The actually observed districts of shock have been mainly along the lines of the valleys of the Rhine and Rhone, and in an inferior degree along those of the Loire, Seine, Garonne, and Meuse (the Pyrenees being viewed as part of the Spanish region), the tendency being to a direction in length of the valley, others across these. When the physical and geological features of France and the Rhine basin are recalled, it can scarcely be doubted that they constitute a natural independent seismic region, with centres of disturbance connected probably at great depths with the extinct volcanic countries of central France and of the Rhine. The almost continual slight disturbances of St. Maurienne, lasting for more than fifteen months at one time, appear quite analogous to those of Comrie and East Haddam. For the specialities of these and other questions of the French system, however, the memoir itself of Perrey must be consulted.

The basin of the Rhone has been consigned to a separate memoir. The precise limits assigned to the district are not stated; but we must assume them to extend somewhat vaguely beyond the actual catchment of the river. The results are given in

TABLE VIII.—Earthquakes of the Basin of the Rhone.

Century.	Earthquakes with date of Day or Month.												With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
XVI. ....	1	...	1	...	2	1	...	...	3	...	...	1	1	10
XVII. ....	6	3	1	1	3	3	...	1	6	1	...	2	2	29
XVIII. ...	7	5	6	6	3	5	7	4	4	8	6	7	3	71
XIX. ....	12	12	8	3	3	2	2	4	6	6	8	14	1	81
Total ...	26	20	16	10	11	11	9	9	19	15	14	24	7	191
	Winter 62			Spring 32			Summer 37			Autumn 53				

presenting considerable similarity to the results for France as a whole. The following are the proportional numbers for the months:—

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1·69	1·31	1·06	0·66	0·71	0·71	0·59	0·59	1·24	0·98	0·92	1·57

Or, for Winter ..... 1·35  
 „ Spring..... 0·69  
 „ Summer ..... 0·81  
 „ Autumn ..... 1·16

and for the two months each of

Winter Solstice ..... 1·53  
 Spring Equinox ..... 0·81  
 Summer Solstice..... 0·61  
 Autumn Equinox ..... 1·05

and as to direction, following his usual method, Perrey arrives at a mean general horizontal resultant,—

S. 9° 44' W. to N. 9° 44' E.

This is not far from the general line of the course of the Lower Rhone ; but Perrey remarks that numerous examples occur of shocks whose alleged horizontal movements were orthogonal to the river-valley, and to the meridian.

We pass on to the basin of the Rhine, which, in its entire extent, comprehends, in fact, a large portion of Switzerland, but whose precise limits Perrey does not define.

TABLE IX.—Earthquakes of the Basin of the Rhine and Switzerland.

Century.	Earthquakes with date of Day or Month.												With date of Season only.		With date of Year only.	Total
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Autumn and Winter.	Spring and Summer.		
IX. ....	3	2	1	2	...	1	...	...	1	1	...	5	1	...	2	19
X. ....	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	2
XI. ....	...	2	1	...	2	...	...	...	...	1	...	1	...	...	2	9
XII. ....	2	...	...	...	...	1	...	...	...	...	...	...	...	...	5	8
XIII. ....	1	...	...	...	...	...	...	...	...	...	...	...	...	1	1	3
XIV. ....	1	1	3	1	3	2	1	...	2	1	1	...	1	...	1	18
XV. ....	...	1	1	1	1	1	1	1	...	...	3	2	...	...	...	12
XVI. ....	4	5	4	5	3	2	2	2	6	3	5	6	...	...	5	52
XVII. ....	21	14	11	6	10	5	8	6	9	4	8	12	...	...	6	120
XVIII. ....	15	12	10	9	6	12	11	10	8	9	17	20	...	...	2	141
XIX. ....	15	17	13	12	11	6	12	11	10	17	24	25	...	...	...	173
Total...	62	54	44	37	36	30	35	30	36	36	58	71	2	1	25	557
	Winter 160			Spring 103			Summer 101			Autumn 165						

The autumn and winter together here present a number, having nearly the same ratio to that of spring and summer together, as 3 : 2.

And at the critical periods of the year, of two months each, we have

Winter Solstice .....	133
Spring Equinox .....	81
Summer Solstice .....	65
Autumnal Equinox .....	72

while, as respects horizontal direction,

S. to N. ....	0·78
N.E. „ S.W. ....	0·44
E. „ W. ....	1·33
S.E. „ N.W. ....	0·89
S. „ N. ....	2·00
S.W. „ N.E. ....	1·11
W. „ E. ....	0·78
N.W. „ S.E. ....	0·67

and, by calculations on before-given principles, a mean general horizontal direction of

S. 7° 9' E. to N. 7° 9' W.

which corresponds pretty well with the general direction of the river valley. Observation, however, indicates, in most of the localities upon its banks, frequent and wide occasional departures from such direction; and, indeed, in the broken country forming a large portion of its length it is improbable it should be otherwise.

The basin of the Danube.—This vast tract of country has been left very ill-defined as to its limits by Perrey, as respects the subject of his research. His catalogue shows that he does not limit himself precisely to the catchment of this mightiest of European rivers, but, in fact, includes something like the whole of that vast tract of country between a line on the north, reaching from Prague to Kherson; and on the south, from Venice to Constantinople, and even occasionally stretching beyond these limits.

TABLE X.—Earthquakes of the Basin of the Danube.

Century.	Earthquakes with date of Day or Month.												With date of Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter and Autumn.	Spring and Summer.		
V. to XV...	1	1	...	...	2	1	1	1	1	...	...	...	...	...	11	19
XVI. ....	3	1	...	...	3	4	1	1	3	...	1	1	1	...	16	35
XVII. ....	2	4	1	...	...	1	2	3	...	...	2	5	...	...	11	31
XVIII. ....	11	10	4	8	8	5	6	9	1	7	5	8	2	...	4	88
XIX. ....	14	15	9	8	12	8	16	11	11	16	10	12	1	1	1	145
Total ...	31	31	14	16	23	19	26	25	16	23	18	26	4	1	43	318
	Winter 76			Spring 60			Summer 67			Autumn 67						

Perrey remarks, that although the total number of shocks recorded appears



great, it is very small in proportion to the enormous area embraced—nearly ten times that of the basin of the Rhone; and he justly concludes, that, were it not for the penury of records in those regions, so much of which is semibarbarous or thinly inhabited, the total number in it would be far greater than he gives. While the general character of shocks here is not that of great intensity, instances are to be found of some, of disastrous power. The relative numbers are for

Winter Solstice .....	1·33
Spring Equinox .....	0·70
Summer Solstice .....	1·05
Autumnal Equinox .....	0·91

and as respects horizontal direction, the results are,—

N.	to S.	.....	1·33
N.E.	„ S.W.	.....	0·50
E.	„ W.	.....	1·33
S.E.	„ N.W.	.....	0·50
S.	„ N.	.....	1·17
S.W.	„ N.E.	.....	1·00
W.	„ E.	.....	1·33
N.W.	„ S.E.	.....	0·85

from which Perrey obtains a mean general horizontal direction of

W. 2° 39' N. to E. 2° 39' S.

This is again very much the line of the Lower Danube itself, which, however, over so vast an area, and fed by vast rivers poured into it on the northern side between great flanking ranges passing more or less north and south, can in reality exercise little or no influence; and too much stress must not be laid upon any observation as to line of *direction*, even when the azimuth surface may be reliable. This applies to every earthquake country; uninstructed observers are very liable to mistake the direction of movement, by confounding the direct effects of the shock with those due to inertia of bodies moved. In the Danube basin, it must at present remain undecided whereabouts the centre or centres of disturbance proper to the region are to be found. On the north, the Carpathians probably are above the centre for those whose horizontal direction is more or less north and south; but whether the shocks from east to west, and veering towards the north or occasionally to the south, have their origin in the Caucasus, or beneath the eastern extremity of the Euxine, or are also in connexion with the great seismic energies that so powerfully and frequently display themselves in Syria and the south-east, indeed all over Asia Minor, yet requires to be investigated.

In the region of the Italian Peninsula, Perrey includes the whole of Italy and the mass of the Alps, exclusive of Savoy (which is included in the basin of the Rhone), with Sicily, Malta, Sardinia, &c., reaching into the centre of the Mediterranean Sea; and, on the north, all the localities whose watersheds are not into the Rhone, Rhine, or Danube. For the conventional limits which Perrey has fixed for himself in deciding upon the *isolation* in point of time of each distinct earthquake, often in this region continuing for many days with little interruption, the memoir itself must be consulted.

TABLE XI.—Earthquakes of the Italian Peninsula, with Sicily, Sardinia, and Malta.

Century.	Earthquakes with date of Day or Month.												With date of Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Autumn and Winter.	Spring and Summer.		
IV.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	6
V.....	...	...	...	...	...	...	...	...	...	...	...	...	1	...	4	5
VI.....	...	...	...	...	...	...	...	...	...	1	...	1	...	...	1	3
VII.....	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1
VIII.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2
IX.....	...	...	...	1	...	1	...	...	...	...	...	1	...	...	3	6
X.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	3
XI.....	1	1	1	1	...	...	...	...	...	...	...	...	...	...	3	7
XII.....	2	1	...	...	...	...	...	...	...	1	...	1	1	...	12	18
XIII.....	1	...	...	2	1	...	...	...	1	...	1	1	...	...	8	15
XIV.....	3	1	...	...	1	1	...	...	3	...	2	3	...	...	6	20
XV.....	...	1	1	...	...	...	...	1	...	1	...	6	...	...	7	18
XVI.....	2	...	1	1	3	1	1	1	2	...	2	2	1	...	15	32
XVII.....	10	15	14	15	4	13	8	7	10	4	6	3	2	1	9	121
XVIII.....	45	41	43	29	38	46	21	31	24	44	31	30	2	1	12	438
XIX.....	37	39	38	35	32	24	33	36	23	41	22	29	...	...	1	390
Total ...	101	99	98	84	80	86	63	77	63	92	64	77	7	2	92	1085
	Winter 298			Spring 250			Summer 203			Autumn 233						

M. Perrey, having obtained access to the work of Muratori and other documents, produced a supplement to this memoir, the result of which he has given in

SUPPLEMENTAL TABLE XII.—Italian Peninsula, Sicily, Sardinia, and Malta.

Century.	Earthquakes with date of Day or Month.												With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
VIII.....	...	...	...	...	...	...	...	...	...	...	...	...	1	1
IX.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...
X.....	...	...	...	...	...	...	...	...	...	...	...	...	3	3
XI.....	...	...	...	1	...	...	...	...	2	...	...	...	2	5
XII.....	4	...	...	1	2	1	...	1	...	1	...	...	12	22
XIII.....	2	...	...	2	1	1	2	1	...	2	3	1	11	26
XIV.....	5	5	6	2	4	2	4	1	6	3	1	6	6	51
XV.....	5	2	4	2	3	3	1	10	5	1	4	5	2	47
XVI.....	1	...	...	1	1	1	...	...	...	...	...	...	1	5
XVII.....	...	...	2	4	...	...	1	...	1	1	...	...	...	9
XVIII.....	1	1	1	2	1	3	2	2	1	4	1	...	1	20
XIX.....	7	5	10	8	8	10	8	10	4	4	4	10	...	88
Total ...	25	13	23	23	20	21	18	25	19	16	13	22	39	277
	Winter 61			Spring 64			Summer 62			Autumn 51				

In the first of these, the winter and spring earthquakes together are to the summer and autumn together

as 6 : 5.

In the supplemental table taken alone, however, the winter season has lost its preponderance, and autumn shows the smallest number.

The number in winter and autumn together, however, still slightly exceeds that for spring and summer, in the ratio of 9 : 8.

While this shows the usual doubtfulness of generalizations from partial data, the result rather tends to awaken increased attention to the very prevalent excess of seismic action in the winter half-year, shown by so many catalogues, and here sustained, though by a supplement, that, taken alone, somewhat departs from the principle.

As regards direction, he finds

N.	to S.	.....	0.82
N.E.	„ S.W.	.....	1.08
E.	„ W.	.....	1.94
S.E.	„ N.W.	.....	1.29
S.	„ N.	.....	1.29
S.W.	„ N.E.	.....	0.40
W.	„ E.	.....	0.91
N.W.	„ S.E.	.....	0.28

and the mean general horizontal direction of resultant

S. 72° 27' E. to N. 72° 27' W.

Observation by no means accords with any such general mean direction. It has repeatedly indicated movements in Italy and Sicily in every azimuth—perhaps with some greater prevalence of those from north to south, and the reverse; but the fact appears to be that these regions have their centre of disturbance almost directly beneath, and hence, as is the case in South America, and the Moluccas, Philippines and Sunda Islands, the emergence of the wave generally makes an extremely large angle with the horizon; and the horizontal component is ill-suited to easy observation. The most fearful earthquakes with which this region has been visited, and whose force has reached France, Germany, Holland, and England, and into Africa, are said to have had a point within their immediate ciucture where the shock was absolutely vertical, as in the Riobambe earthquake recorded by Humboldt.

The memoir of Perrey on Algiers and Northern Africa is brief; and he laments that the want of information, and of access to sources of it not attainable, prevented his collecting a sufficient number to found any generalization upon. The following results alone he is able to tabulate:—

TABLE XIII.—Earthquakes of Algeria and Northern Africa.

Earthquakes with date of Month.												With date of Year only.	Total.
January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
5	2	6	7	3	2	2	5	1	4	8	1	17	63
Winter 13			Spring 12			Summer 8			Autumn 13				

The want of further historic information upon this region is much to be regretted. It has been, since anything has been recorded of it, known as subject to earthquakes. Cities, the sites of bishoprics in the ancient Christian church of Africa, were thus demolished, and now astonish the traveller amidst rocky solitudes by acres of hewn stone on the sites of prostrate edifices that mark the past magnificence of Carthaginian and Roman rule. And at the present day, earthquakes are frequent and serious, as the many edifices erected by the French since they have been in possession of Algeria, and since thrown down, demonstrate.

Whether, as a seismic region, Northern Africa have a centre of disturbance of its own, and if so, whether this exists deep within the little-known recesses of the Atlas chain, or beneath the southern verge of the Mediterranean basin, or whether its disturbances are only derivative, and have their centre either in the volcanic region of the Canaries or amongst the towering peaks of Abyssinia, all yet remains to be discovered. No information worthy of any confidence has reached me as to the general horizontal direction of shocks in this region. How much to be desired is it, that the government of the Emperor of the French would systematize seismoscopic observations in their African possessions!

The last of Perrey's European series now comes before us; and in the following table he has given the results for—

TABLE XIV. — Earthquakes of the Turco-Hellenic Territory, Syria, the Ægean Islands, and Levant.

Century.	Earthquakes with date of Day or Month.												With date of Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Autumn and Winter.	Spring and Summer.		
IV. ....	...	...	...	...	...	...	1	1	...	1	...	1	3	1	15	23
V. ....	1	...	1	3	...	1	...	...	3	...	1	...	...	...	9	19
VI. ....	1	1	...	1	1	...	2	2	2	3	2	2	...	...	10	27
VII. ....	...	...	...	1	...	1	...	...	...	...	...	...	...	...	6	8
VIII. ....	2	2	1	1	1	...	...	...	...	1	...	...	...	1	3	12
IX. ....	1	...	...	...	1	...	...	2	...	...	...	...	1	...	2	7
X. ....	...	...	...	...	...	...	...	...	2	2	1	...	...	...	...	5
XI. ....	1	2	1	...	...	1	...	1	1	...	1	3	...	...	7	18
XII. ....	...	...	...	...	1	1	...	...	...	...	...	2	...	...	19	23
XIII. ....	...	...	1	...	1	1	...	...	...	...	...	1	...	...	9	13
XIV. ....	...	1	1	...	...	...	...	2	...	...	...	...	...	1	3	8
XV. ....	...	...	...	1	...	...	...	...	1	1	1	...	...	...	7	11
XVI. ....	...	...	2	...	2	1	...	...	1	...	1	1	...	...	14	22
XVII. ....	3	1	3	4	4	1	6	2	5	1	5	1	...	...	17	53
XVIII. ...	9	8	5	9	10	13	12	8	11	8	9	8	2	...	12	124
XIX. ....	22	20	16	10	16	15	14	22	14	17	12	14	2	2	1	197
Total ..	40	35	31	30	37	35	35	40	40	34	33	33	8	5	134	570
	Winter 106			Spring 102			Summer 115			Autumn 100						

This vast region embraces the Turco-Greek peninsula, from Trieste to Constantinople southward of the Balkan range, the Greek Archipelago and Asia Minor to Bagdad, with a portion of Syria and the Levant.

Perrey remarks, that the number of facts he has been able to collect are

fewer than the known seismic character of the region warrants, and rightly attributes this to want of record, and to the want of communication in these parts of the world. He also remarks (what has been pointed out in the Second Report as applying to Antioch, &c.) that here seismic energy appears to have been in various localities extremely paroxysmal in its action, with long periods of intermediate cessation. In the Turco-Greek peninsula, earthquakes have long been both frequent and formidable.

For the four critical periods of the year he finds

Winter Solstice .....	73
Spring Equinox.....	61
Summer Solstice .....	70
Autumnal Equinox .....	74

Pouqueville ('Voyage en Grèce') has given some very singular facts and speculations as to the time of year of earthquakes in Epirus, &c., in relation to the rains. They need inquiry and confirmation.

In analysing the horizontal direction of shock, Perrey has deemed it proper to separate the region under three sub-districts, in consequence of the broken character of the Greek peninsula, and the very diverse *orientation* of the coasts, river-courses, and mountain-ranges throughout all its parts.

Directions.	Adriatic. Trieste to Zanté.	Constantinople.	Smyrna.	Total.
N. to S. ...	4	2	2	9*
N.E. to S.W. ...	...	...	...	...
E. to W. ...	2	...	...	3†
S.E. to N.W. ...	1	...	...	1
S. to N. ...	4	1	1	6
S.W. to N.E. ...	1	...	...	1
W. to E. ...	3	...	...	3
N.W. to S.E. ...	2	1	1	5‡

These figures are meagre enough. By the usual method, Perrey calculates a mean general horizontal direction of shock,

N. 34° 37' W. to S. 34° 37' E.

The deduction, however, is plainly in this instance of little value. Many shocks in this region have been described as approximating to vertical; and this is to be anticipated from one having a centre of disturbance almost in its midst with active volcanic action. All its eastern end, Syria, &c., however, has some separate centre of disturbance, either in connexion with the eastern chains of Asia Minor, which appear to abound in igneous formations or with the Southern Arabian centre; while Constantinople, the Dardanelles, and the western and southern shores of the Euxine may also be in connexion with the Caucasian centre of action.

We have now completed Perrey's European series. He passes to the American by the discussion of the basin of the Atlantic, viewed as comprehending all from Iceland on the north to Tristan d'Acunha on the south, and on the east and west everything between the shores of the continents of the New and Old Worlds.

Within this oceanic expanse no less than five great and probably connected centres of volcanic action exist: Iceland, the Azores, the Canaries,

\* Including once for Aleppo.

† Including once for Latakia.

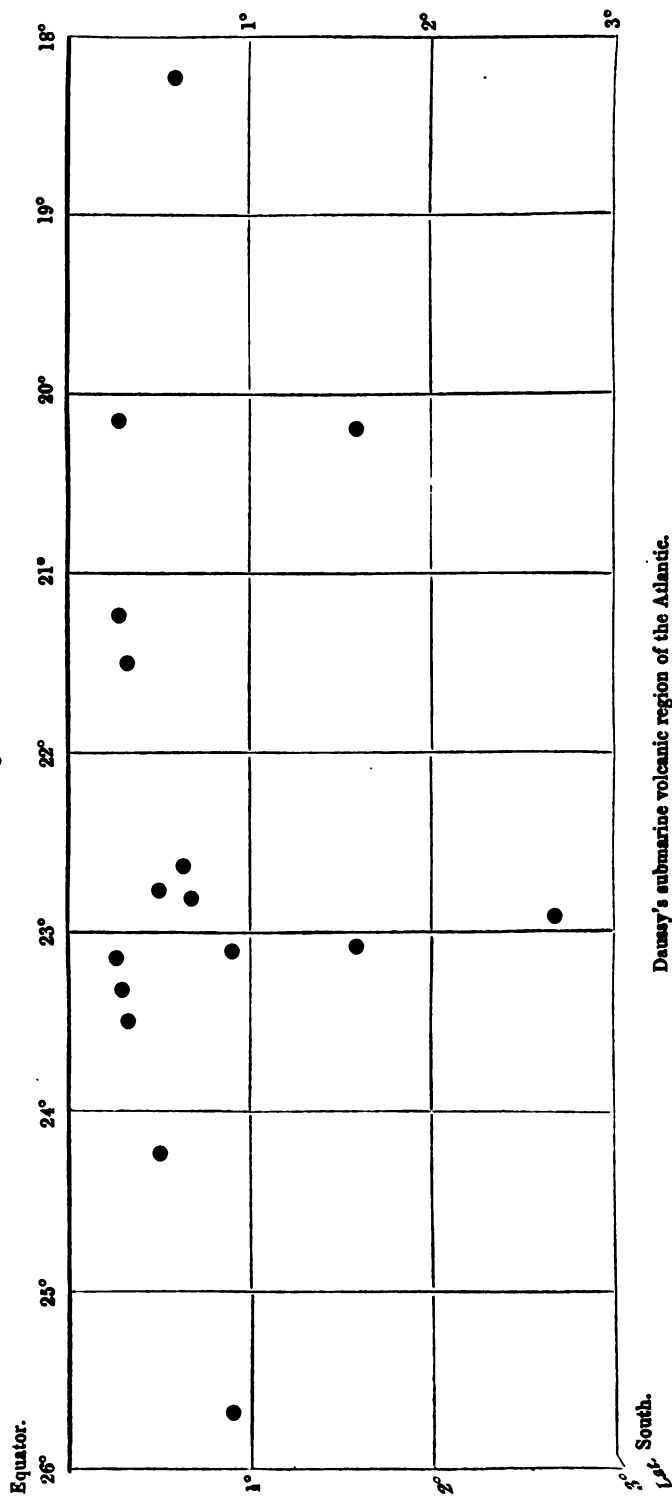
‡ Including once for Thassia.

the Cape de Verds, the West India Islands, and the great submarine volcanic region first noticed by M. Daussy, besides many other points, as Ascension, St. Helena, St. Paul's, &c., at which extinct volcanic phenomena are visible. The number of observations, however, as yet recorded of earthquake-shocks within the basin is so very small, that Perrey has been only able to collect from 130 to 140 instances between the years 1430 and 1847, or about three a year on the average; so that he does not deem the basis large enough to warrant any numerical discussion. The observations of M. Daussy, "Sur l'existence probable d'un volcan sousmarin situé par environ  $0^{\circ} 20'$  de lat. S. et  $22^{\circ} 0'$  de lon. ouest," published in vol. vi. p. 512, 'Comptes Rendus de l'Académie' (1853), have, however, made this one of the most interesting seismic regions on the globe.

M. Moreau de Jonnés ('Comptes Rendus,' vol. vi. p. 302) has given two recorded observations on board French ships, the 'Cæsar' and the 'Sylphide,' which render the existence of a submarine volcanic tract on the bank of Bahama highly probable; but M. Daussy has collected and given observations of shocks received by vessels at sea at various periods, but all within a given limited area, which renders the existence almost certain of a vast active volcanic suboceanic area in the basin of the Atlantic, nearly midway between Cape Palmas on the west coast of Africa, and Cape St. Roque on the east coast of South America, or in the narrowest part of the ocean between these continents. This vast disturbed and perhaps partially igneous ocean-floor can be no less than nine degrees in length from west to east, and from three to four degrees in breadth from north to south. The following are the observations given by Daussy; and the relative positions of the several recording ships are given in the diagram (fig. A.):—

- 17th Oct. 1747.—The ship 'Le Prince,' Bobriant: two shocks. Lat.  $1^{\circ} 35'$  S.; long.  $20^{\circ} 10'$  W.
- 5th Feb. 1754.—The ship 'Silhouette,' Pintaui: one shock, with trembling. Lat.  $0^{\circ} 20'$  S.; long.  $23^{\circ} 10'$  W.
- 13th April 1758.—The frigate 'Fidèle,' Lehoux: several shocks. Lat.  $0^{\circ} 20'$  S.; long.  $23^{\circ} 10'$  W.
- 3rd May 1761.—The ship 'Le Vaillant,' Bouvet: saw an islet of sand above water, in lat.  $0^{\circ} 23'$  S. and long.  $21^{\circ} 30'$  W.
- 3rd Oct. 1771.—The frigate 'Le Pacifique,' Bonfil: one shock and trembling. Lat.  $0^{\circ} 42'$  S., and long. by estimation,  $22^{\circ} 47'$  W. An agitated sea, and no bottom found on sounding.
- 19th May 1806.—M. de Krusenstern (ship's name not given). Lat.  $2^{\circ} 43'$  S., and long.  $22^{\circ} 55'$  W. Saw columns of smoke twelve or fifteen miles to the N.N.W., which he and Dr. Horner attributed to volcanic submarine eruption.
- 18th Dec. 1816.—The ship 'The Triton,' Proudfoot: in lat.  $0^{\circ} 23'$  S., and long.  $20^{\circ} 6'$  W., passed over a shoal of about three miles from east to west, and one mile from north to south. Twenty-six fathoms water, with bottom of brown sand.
- 12th April 1831.—The ship 'Eagle,' J. Taylor: in lat.  $0^{\circ} 22'$  S., and long.  $23^{\circ} 27'$  W., the sea being perfectly calm; one violent shock: the rudder was powerfully shaken, and a muffled sound was heard from beneath.
- Nov. 1832.—The ship 'La Seine,' Le Maire: in lat.  $0^{\circ} 22'$  S., and long.  $21^{\circ} 15'$  W. Under easy sail; one powerful shock.
- 9th Feb. 1835.—The barque 'The Crown,' of Liverpool (captain's name not given): lat.  $0^{\circ} 57'$  S., and long.  $25^{\circ} 39'$  W. When going six knots, was thought suddenly to have struck on a coral rock and to have

Fig. A.



grated over it; but on sounding directly after, found 135 fathoms water.

28th Jan. 1836.—The ship 'Philantropie de Bordeaux,' *Jayer*: in lat.  $0^{\circ} 40' S.$ , and long.  $22^{\circ} 30' W.$  Violent shock and trembling for three minutes.

13th & 16th March 1836.—The American ship 'St. Paul,' of *Salem* (captain's name not given), being ten miles to the west of the 'Philantropie,' perceived the same shock.

— in 1836 Captain Fergusson, of the ship 'Henry Tanner,' presented to the Royal Asiatic Society of Bengal, through F. L. Huntley, Esq., volcanic ashes or cinders, like black pumice, which he had found on the surface of the sea when much agitated, in lat.  $0^{\circ} 35' S.$  and long.  $18^{\circ} 10' W.$

— In a previous voyage Captain Fergusson, in lat.  $1^{\circ} 35' S.$  and long.  $23^{\circ} 5' W.$ , was alarmed by a violent shock, accompanied by a great noise, as if he had struck upon a rock, but could find no bottom on sounding.

Some other instances are said to be found in the 'Sailing Instructions for the Azores' by Tofino, translated by M. Urvoi de Portzamparc, in the 'Annales Maritimes de France,' which I have not been able to consult. We possess enough, however, to indicate that a submarine volcanic tract is in activity beneath the Atlantic, as large in area as Great Britain, and that the bottom of the ocean there is rendered uneven in the extreme, immense protrusions taking place in deep water. How desirable would it be that some British ships were commissioned to examine this tract more perfectly, especially to obtain accurate soundings and sectional lines of the bottom from east to west and from north to south, and, if possible, to obtain, by dredging or otherwise, good specimens of the material of the bottom, and also observations of the temperature of the sea at various depths!

Our knowledge of the distinguishing marks of suboceanic and subaerial volcanic ejecta, of the chemical reactions producing mineral species, under the conditions (so vaguely understood as yet) of high temperature and great pressure in presence of water, might receive important accessions, if such specimens from the bottom could be obtained from thence (or from other similar positions), while our ideas of the extent to which local ocean currents may be produced and maintained by the local heating of the deep sea immediately above such volcanic tracts might be enlarged, and other trains of future research suggested.

Above all, how forcibly does the existence (so far almost unnoticed and unknown) of this vast volcanic and seismic submarine region indicate the desirableness of having henceforth a well-arranged system of scientific observation and mode of daily entry in the log-book made part of the duties of ships of every civilized maritime nation, and having such entries referred to a special office (with us, probably, in connexion with the Admiralty or with a revived Board of Longitude) for extract, record, and discussion! That certain classes of observations could not be made on board our ships at present, although the zeal of our officers of the navy and of some of the mercantile marine might be counted on, is certain; but it is equally so that very many of the highest value to cosmical science could be made and recorded, if the system were once arranged, the classes of observation determined on, properly ruled and arranged log-books prepared, and the making certain observations (to be determined on by the central board beforehand in each instance) made matter of duty. Navigation and commerce would gain, eventually, quite as much as, by the small sacrifice of time and labour.



they thus gave to science. I venture respectfully to commend it to our own, to the American, and to all European governments.

In his memoir on the Earthquakes of the United States and Canada, Perrey may be said to include the whole northern continent of America, with the exception of Mexico and Central America, to which he has devoted another memoir.

The two following tables, XV. and XVI., give the results of his discussion:—

TABLE XV.—Earthquakes of the United States and of Canada.

Century.	Earthquakes with date of Day or Month.												With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
XVII. ....	3	1	...	...	...	1	...	...	...	1	...	...	4	10
XVIII. ...	7	9	9	3	3	3	6	8	5	7	12	12	6	88
XIX. ....	4	4	3	3	3	...	4	6	3	2	7	5	5	51
Total ...	14	14	12	6	6	4	10	14	8	10	19	17	15	149
	Winter 40			Spring 16			Summer 32			Autumn 46				

Here the number of earthquakes in autumn and winter are to those of summer and spring as 88 to 49, or nearly as 2 to 1; and for Perrey's critical periods:—

Winter solstice.....	31
Spring equinox.....	18
Summer solstice .....	14
Autumnal equinox .....	18

Perrey wholly disputes the verity of Humboldt's conclusion ('Cosmos,' t. i. p. 519, trad. p. M. Fays) that earthquakes are most frequent at the equinoxes, and declares that the results of all his memoirs prove the contrary.

He discusses from his catalogue the relative number of shocks in each State of the Union; but this is comparatively of less importance to science than to social life. He has not been able to ascertain the northern limit of seismic action, but sees ground to believe it has reached Greenland more than once, but that frequent shocks pass no further north than the Canadas.

The only records with direction of motion given are twelve in number, viz.,—

N.W. to S.E. ....	6
W. „ E. ....	3
N.E. „ S.W. ....	2
E. „ W. ....	1

and calculating, upon his already known method, the mean direction from this narrow base, he finds it

N. 31° 54' W., to S. 31° 54' E.;

but he confesses his own opinion, derived from a broad view of all the facts and the topographic character of the country, to be, that the prevailing direction is from north to south, or the contrary.

The vertical component of motion has only been given in one instance here; but there is every reason to presume that the angle of emergence of the seismic wave all over the northern continent of America is steep.

TABLE XVI.—Earthquakes of Mexico and Central America.

Century.	Earthquakes with date of Day or Month.												With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
XVI. ....	...	...	...	...	...	...	...	...	...	...	1	...	5	6
XVII. ....	...	1	2	...	...	...	...	...	...	1	...	...	3	7
XVIII. ...	...	2	4	3	...	3	2	1	3	...	...	...	6	24
XIX. ....	3	2	2	2	6	2	2	1	1	3	2	3	1	30
Total. ...	3	5	8	5	6	5	4	2	4	4	3	3	15	67
	Winter 16			Spring 16			Summer 10			Autumn 10				

The steep emergence of the wave is most remarkable in Mexico, where, at Acapulco, it is frequently felt as a directly vertical pulse from beneath (as at Riobamba).

Perrey does not attempt, from his materials, a full discussion of the horizontal component of motion. The prevailing impression in Mexico is that the direction of shock is parallel to the chain of the Cordilleras. Some, however, of the most remarkable shocks have apparently moved at right angles to the preceding.

The truth is, in a wide region situated close to, and no doubt in great part close *above*, vast centres of disturbance, whose pulses reach the surface generally with large angles to the horizon, there must be horizontal components in every azimuth, and only distinguishable in one more than another, as the accidents of the originating blows, of the heterogeneous formations through which they are transmitted, and the opportunities of exactness of observation, &c. vary.

Perrey concludes this memoir with a *résumé* of the labours of Arago, Von Buch and Berghaus, on the volcanoes of Mexico and the Andes.

In his memoir on the Antilles, Perrey includes Cuba, which has also been the subject of research to M. Poey, now stationed at the Observatory of Havanna—with Hispaniola, Jamaica and Porto Rico in the greater, and in the lesser isles Antigua, Barbadoes, St. Christopher's, Guadaloupe, Martinique, Granada, Trinidad, St. Thomas, Santa Cruz, Dominica, St. Vincent, Tobago, and St. Lucia, &c. In discussing the copious materials at his disposal in this vast region, Perrey has found it necessary to adopt certain conventional licences with reference to some of the very prolonged earthquakes, whose slight but continuous shocks have often (as at Comrie and East Haddam) lasted for a great length of time, reckoning each month of such shocks as equivalent to one great earthquake.

In the following table, XVII., he has given the distribution in time :—

TABLE XVII.—Earthquakes of the Antilles.

Century.	Earthquakes with date of Day or Month.												With Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter and Autumn.	Spring and Summer.		
XVI. ....	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1
XVII. ....	...	1	1	1	1	1	1	...	...	...	...	...	...	...	10	16
XVIII. ...	6	7	3	4	3	5	10	7	9	10	5	3	...	...	13	85
XIX. ....	9	8	19	12	12	10	9	16	12	10	13	12	1	...	2	145
Total ...	15	16	23	17	16	16	20	23	22	20	18	15	1	...	25	247
	Winter 54			Spring 49			Summer 65			Autumn 53						

Contrary to the result usual for Europe, the number of shocks in summer here seems to preponderate; and in the critical periods we have—

Winter solstice .....	30
Spring equinox .....	40
Summer solstice .....	36
Autumnal equinox .....	42

or for autumn and winter together 108; spring and summer 114,—a result equally contrary to what has been found so uniformly for Europe, and to the prevalent belief of the inhabitants of the islands themselves, who deem the equinoxes the dangerous times.

Representing by unity the mean degree of frequency, and by 12 the whole number of earthquakes given with date of month, we find for each month the following proportional number:—

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
0·81	0·87	1·25	0·92	0·87	0·87	1·09	1·25	1·19	1·09	0·98	0·81
0·98			0·89			1·18			0·96		

As regards horizontal direction of shock, his data give—

E. to W. ....	9
S. „ N. ....	5
N. „ S. ....	3
W. „ E. ....	2
N.E. „ S.W. ....	2

from which, by his usual method, he deduces a mean horizontal direction—

E.  $22^{\circ} 5'$  S. to W.  $22^{\circ} 5'$  N.;

and it is worthy of remark, that Deville gives, as greatly disturbed in 1843, the zone running parallel to the great circle of W.  $35^{\circ}$  N. to E.  $35^{\circ}$  S.,

or E. 35° S. to W. 35° N., which is about parallel also to Perrey's mean direction. It must not be forgotten, however, that, in 1812 and in 1843, shocks were observed at right angles to this, and in some cases, as in 1770, in all azimuths; and also that the prevalent opinion of the inhabitants of the West Indian Islands is, that they have a general north and south horizontal direction, thus coming within the scope of the general direction of similar phenomena on the northern and southern continents of America.

M. Poey, of the Observatory, Havana, has published, in the 'Nouvelles Annales des Voyages' for 1855, a memoir and supplement upon the earthquakes of Cuba, separately, with copies of which he has obligingly furnished me. It would be out of place in this Report to discuss M. Poey's views as to the connexion between cyclones, or other storms, and earthquakes, or as to the physical causes of the impulse producing shocks. As regards the first, it may, however, be remarked in passing, that violent and sudden local change of barometer-pressure must (as I have indicated in a former report) be viewed as a *possible inducer* of such reactions beneath the surface as may possibly result in earthquakes; and that as respects the part which water, under heat and pressure, may play in its spheroidal state, I have also indicated fully as much as the present state of our knowledge will sustain. As respects the statistic results of M. Poey's labours, they are embraced in the following table, which combines the facts of both memoir and supplement:—

TABLE XVIII.—Earthquakes of Cuba.

Century.	Earthquakes with date of Day or of Month.												Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	With date of Year only.
XVI. ....	...	...	...	...	...	...	...	...	...	...	...	...	4
XVII. ....	...	4	...	...	...	...	...	...	...	...	...	...	4
XVIII. ....	...	...	...	...	...	...	...	...	...	...	...	...	2
XIX. ....	4	3	2	3	3	4	5	2	6	5	6	4	50
Total ...	4	7	2	3	3	4	5	2	6	5	6	4	9
	Winter 13			Spring 10			Summer 13			Autumn 15			

Cuba, therefore, appears to show 28 earthquakes in the winter and autumn, and 23 only in the summer and spring.

The surface of this single island is, however, perhaps too small to attach much importance to its isolated discussion\*.

The last of Perrey's monographic memoirs is that on Chili and La Plata,

\* While this Report has been passing through the press, I have received from M. Poey a copy of his later and more elaborate "Chronological Catalogue of Earthquakes in the West Indies, from 1530 to 1857, extracted from 'l'Annuaire de la Société Météorologique de France,' tom. v. p. 75, Séance du 25 Mai, 1857," and regret that the limits of a foot-note preclude the possibility of analysis of his valuable memoir.

Of a total of 690 earthquakes, he finds that 142 occurred in winter, 156 in spring, 187 in summer, and 154 in autumn,—thus so far corroborating Perrey's result deduced from a smaller base.

A very complete Seismic Bibliography for the Antilles concludes M. Poey's memoir.

or the region lying between the western slope of the Andes and the sea, from the 25° to the 45° south latitude, between the Desert of Atacama on the north, and the Archipelago of Chonos on the south.

The following table contains his numerical results for a region, however, in which shocks of greater or less intensity are almost of daily occurrence :—

TABLE XIX.—Earthquakes of Chili and the basin of La Plata.

Century.	Earthquakes with date of Day or Month.												With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
XVI. ....	...	...	...	...	...	...	...	...	...	1	...	...	4	5
XVII. ....	...	1	1	...	1	...	...	...	...	...	...	...	6	9
XVIII. ...	1	1	1	...	1	1	...	1	...	...	...	1	3	10
XIX. ....	14	10	14	8	19	11	16	15	16	9	27	8	3	170
Total ...	15	12	16	8	21	12	16	16	16	10	27	9	16	194
	Winter 43			Spring 41			Summer 48			Autumn 46				

From this table he has omitted several earthquakes, whose period has been prolonged to several weeks or even months, by a convention like that adopted here with regard to the memoir of Comrie, &c.

A table of earthquakes noticed as occurring in Peru from A.D. 1810 to 1835, by M. Castelnau, was presented to the Academy of Sciences in 1847, by Arago ('Comptes Rendus,' 2 Nov. 1847); but the catalogue itself is not given, and I am not aware that it has appeared elsewhere.

M. Lambert, mining engineer of Chili, in a memoir on the causes of earthquakes in Chili and Peru ('Ann. de Chim. et de Phys.,' t. xlii. pp. 392-405), published in 1829, mentions that the Chilians vulgarly divide their year into three seasons or "temporadas," and that one of these, the first, composed of January, February, March, and April, is called "temporada de los temblores," or earthquake season; on comparing the facts of his catalogue, with the popular belief however, Perrey finds the facts palpably contradict it.

As to the prevalent horizontal direction here, Perrey makes no attempt to discuss it, contenting himself with the remark, that the popular belief is universal in the region, that it follows the chain of the Cordillera. In a country, however, having so little of its *observed* surface (for the great sandy deserts are nearly unknown as respects our inquiry) of a level character, with a general seaward slope from the great central axis, and with the origin of disturbance so closely beneath, that many of the most formidable earthquakes have emerged almost vertically over considerable tracts, the attempt to fix a prevailing horizontal direction would be nugatory.

Finally, we come to the two last of Perrey's memoirs which have been referred to—those in which he has brought under one view many of the facts of his monographs, and graphically discussed the results in tables for all Europe, with the adjacent parts of Africa and of Asia, and for the north of Europe with the north of Asia, viewed as one great boreal band. The results of the former are given in the following Table :—

TABLE XX.—Résumé of the Earthquakes of Europe, and of the adjacent parts of Asia and of Africa, from A.D. 306 to 1843.

Century.	Earthquakes with date of Day or Month.												With date of Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter and Autumn.	Spring and Summer.		
IV. ....	...	...	...	...	...	...	1	...	...	1	...	2	3	1	12	21
V. ....	1	...	...	3	...	2	1	...	2	...	2	...	3	...	11	25
VI. ....	...	1	...	2	2	1	2	1	2	3	2	3	1	...	11	31
VII. ....	...	...	...	1	...	1	...	2	...	...	...	...	...	...	6	10
VIII. ....	2	2	1	1	1	...	...	...	...	...	...	...	1	...	3	11
IX. ....	4	2	...	1	1	1	...	1	2	2	...	6	5	1	10	36
X. ....	1	...	1	1	...	...	...	...	1	2	1	1	1	...	8	17
XI. ....	1	4	5	1	2	1	2	2	4	3	3	3	1	...	19	51
XII. ....	8	2	2	3	3	2	...	3	3	...	1	4	3	...	34	68
XIII. ....	3	2	3	1	5	...	2	...	1	...	2	5	4	...	27	55
XIV. ....	1	1	3	...	3	4	3	2	4	3	4	4	2	2	22	58
XV. ....	...	1	1	1	2	2	2	2	1	2	2	7	...	1	17	41
XVI. ....	10	5	6	8	10	4	2	3	9	3	6	10	3	...	31	110
XVII. ....	21	16	15	13	6	9	10	3	14	3	10	17	1	1	41	180
XVIII. ....	77	53	45	52	36	49	49	49	32	62	55	62	14	4	21	660
XIX. ....	99	100	90	59	55	55	74	78	72	92	60	78	6	1	6	925
Total ...	228	189	172	147	126	131	148	147	147	176	148	202	48	11	279	2299
	Winter 589			Spring 404			Summer 442			Autumn 526						

Autumn and winter still preponderate thus for entire Europe. As regards the "critical periods" of the year, the results are—

For XIX. Century. For the whole period.

Winter solstice .....	177	253
Spring equinox .....	151	170
Summer solstice.....	129	150
Autumnal equinox .....	164	159

and for the half year, and XIX. century only—

Autumn and Winter .....	527
Spring and Summer .....	394

and for the whole period of nearly 15½ centuries—

Autumn and Winter .....	1165
Spring and Summer .....	857

or about as 1 : 0·75.

The mean *annual* number of earthquakes in Europe, &c., deduced from the data of the ten years between 1833–1842, while it was everywhere at peace, and intelligence well conveyed, Perrey finds to be nearly 33 per annum. He considers that one-fifth more may probably have occurred that have not come to his knowledge, so that the mean annual number would be 40, or between 4 and 5 per month.

The remainder of this memoir is occupied with remarks upon very numerous and interesting secondary phenomena, recorded of the earthquakes referred to in the catalogue discussed.

In the last memoir—that in which Perrey discusses the earthquakes of northern Europe and northern Asia together—he expresses with some caution his own belief that the preponderance of seismic phenomena in the winter half-year above the summer half, in the ratio above given, is worthy of acceptance as an empiric law for Europe at least, but doubts whether it may be extended to the other hemisphere.

The geographical limits of this seismic region are somewhat arbitrary, reaching from the Elbe on the west to the extremity of Kamtschatka on the east; bounded on the north, in Europe, by the Baltic and White Seas, but in Asia reaching to the Arctic shores; and on the south, in Europe, by a great circle passing north of the Carpathian Mountains to the Euxine, the Caucasus and the Caspian, and thence by the Desert of Gobi to the Sea of Okhotsk—a vast tract, containing many important mountain-chains, though principally distinguished, as Perrey remarks, by its immense plains and low table-lands.

The eight following tables give not only his numerical results for this region, but a general comparative view of the numerical results of nearly the whole of his memoirs, for which I have somewhat extended some of the tables, and changed their order slightly.

TABLE XXI.—Earthquakes of the Northern Zone of Europe.

Century.	Earthquakes with date of Day or Month.												Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter and Autumn.	Spring and Summer.		
VIII. to XVI.	2	1	1	1	3	2	1	2	1	...	1	...	...	2	8	25
XVII. ....	3	5	...	1	...	...	...	1	1	...	2	2	...	...	4	19
XVIII. ....	10	7	4	4	4	1	2	5	4	4	3	5	1	...	...	54
XIX. ....	12	5	4	5	6	3	2	4	2	9	7	6	...	...	...	65
Total ...	27	18	9	11	13	6	5	12	8	13	13	13	1	2	12	163
	Winter 54			Spring 30			Summer 25			Autumn 39						

TABLE XXII.—Earthquakes of the Northern Zone of Asia.

Century.	Earthquakes with date of Day or Month.												With Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter and Autumn.	Spring and Summer.		
XVIII. ....	3	6	2	1	1	...	1	2	2	2	1	3	1	...	7	32
XIX. ....	4	6	6	4	4	3	5	7	6	3	4	5	...	...	...	57
Total ...	7	12	8	5	5	3	6	9	8	5	5	8	1	...	7	89
	Winter 27			Spring 13			Summer. 23			Autumn 18						

TABLE XXIII.—Earthquakes of the Northern Zone of Europe and of Asia together.

Century.	Earthquakes with date of Day or Month.												With Season only.		With date of Year only.	Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter and Autumn.	Spring and Summer.		
VIII. to XVI.	2	1	1	1	3	2	1	2	1	...	1	...	...	2	8	25
XVII. ....	3	5	...	1	1	...	...	1	1	...	2	2	...	...	4	20
XVIII. ....	13	13	6	5	5	1	3	7	6	6	4	2	2	...	7	86
XIX. ....	16	11	10	9	10	6	7	11	8	12	11	11	...	...	...	122
Total ...	34	30	17	16	19	9	11	21	16	18	18	21	2	2	19	253
	Winter 81			Spring 44			Summer 48			Autumn 57						

TABLE XXIV.—General Result as to Mensual Relative Frequency of Earthquakes.

Regions.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual ratio.
Europe (the whole) ...	1.35	1.11	1.07	0.95	0.85	0.81	0.87	0.95	0.89	1.02	0.93	1.21	34.32
France and Belgium ...	1.52	1.17	0.97	1.01	0.77	0.66	0.86	0.73	0.91	0.88	1.09	1.43	7.02
Italy and Savoy ...	1.16	1.13	1.27	1.05	0.96	0.96	0.94	0.94	0.76	1.13	0.76	0.94	10.83
Basin of the Rhone ...	1.69	1.31	1.06	0.66	0.71	0.71	0.59	0.59	1.24	0.98	0.92	1.57	1.91
Basin of the Danube...	1.38	1.38	0.62	0.71	1.11	0.84	1.16	1.11	0.71	1.02	0.80	1.16	3.18
Scandinavia ...	1.85	1.12	1.18	0.75	0.90	0.56	0.95	0.73	1.01	0.95	1.06	0.95	2.52
Europe, Northern Zone	2.19	1.46	0.73	0.89	1.05	0.49	0.43	0.98	0.66	1.05	1.05	1.05	1.63
Asia, Northern Zone...	1.04	1.78	1.19	0.74	0.74	0.44	0.89	1.33	1.19	0.74	0.74	1.19	.89
Both Zones united ...	1.78	1.57	0.89	0.84	0.94	0.47	0.58	1.10	0.84	0.94	0.94	1.10	2.52

TABLE XXV.—Result as to Relative Frequency in Season.

Region.	Winter.	Spring.	Summer.	Autumn.
Europe (the whole) ...	1.18	0.87	0.90	1.05
France and Belgium ...	1.22	0.81	0.83	1.13
Italy and Savoy .....	1.19	0.99	0.88	0.94
Basin of the Rhone ...	1.35	0.69	0.81	1.16
Basin of the Danube...	1.13	0.89	0.99	0.99
Scandinavia .....	1.38	0.73	0.90	0.99
Europe, Northern Zone	1.49	0.81	0.69	1.05
Asia, Northern Zone...	1.33	0.67	1.13	0.89
Both Zones united ...	1.41	0.75	0.84	0.99



TABLE XXVI.—Result as to Relative Frequency at the Equinoxes and Solstices.

Region.	Winter Solstice.	Spring Equinox.	Summer Solstice.	Autumnal Equinox.
Europe (the whole) ...	1.25	0.99	0.89	0.93
France and Belgium ...	1.43	0.96	0.73	0.87
Italy and Savoy.....	1.02	1.13	0.93	0.92
Basin of the Rhone ...	1.53	0.81	0.61	1.05
Basin of Danube .....	1.33	0.70	1.05	0.91
Scandinavia .....	1.36	0.94	0.74	0.95
Europe, Northern Zone	1.74	0.87	0.48	0.91
Asia, Northern Zone...	1.20	1.04	0.72	1.04
Both Zones united ...	1.48	0.96	0.58	0.98

TABLE XXVII.—Result as to Relative Directions of Horizontal Component of Shock.

Region.	N. to S.	N.E. to S.W.	E. to W.	S.E. to N.W.	S. to N.	S.W. to N.E.	W. to E.	N.W. to S.E.	Total.
Europe (the whole) ...	1.57	0.65	1.65	0.67	1.12	0.88	0.88	0.60	464
France and Belgium ...	1.50	0.43	1.88	0.59	1.02	0.96	0.91	0.69	149
Italy and Savoy.....	1.09	0.91	2.25	0.91	1.09	0.51	0.87	0.29	110
Basin of the Rhone ...	1.30	0.37	1.30	0.56	1.86	1.12	1.12	0.37	43
Basin of the Danube...	1.33	0.50	1.33	0.50	1.17	1.00	1.33	0.83	48
Scandinavia .....	0.73	1.09	0.73	1.09	1.09	1.45	1.09	0.73	22
Europe, Northern Zone	1.19	0.60	1.48	0.30	2.07	0.00	1.98	0.59	27
Asia, Northern Zone...	2.35	1.88	0.94	0.47	0.47	0.94	0.00	0.94	17
Both Zones united ...	1.64	1.09	1.27	0.36	0.45	0.36	1.09	0.73	44

TABLE XXVIII.—Result as to Comparative General Resultant Horizontal Direction and Intensity.

Region.	Resultant Horizontal Direction.	Intensity of Resultant.
Europe (the whole) .....	E. 33° 42' N.	0.61
France and Belgium .....	N. 71° 27' E.	0.56
Italy and Savoy .....	S. 85° 51' E.	2.15
Basin of the Rhone .....	S. 9° 44' W.	1.23
Basin of the Danube.....	W. 2° 39' N.	0.66
Scandinavia .....	S. 22° 30' W.	0.94
Europe, Northern Zone .....	S. 17° 45' W.	0.23
Asia, Northern Zone.....	N. 23° 48' E.	3.14
Both Zones united .....	N. 23° 55' E.	1.06
British Islands .....	S. 39° 5' W.	?
Spanish Peninsula.....	E. 31° 56' S.	?
Basin of the Rhine .....	S. 7° 9' E.	?
Turco-Hellenic Territory .....	N. 34° 37' W.	?
Mexico and Central America ...	N. 31° 54' W.	?
The Antilles .....	E. 22° 5' S.	?

There remains to be noticed, of M. Perrey's labours, his discussion of the periodicity of the earthquakes of his annual catalogues for 1844, 1845, 1846, and 1847, with reference to the phases of the moon's motions, published in 'Mém. de l'Académie des Sciences de Dijon,' 1848, 1849, part. de Sciences, p. 105, &c., and also presented to the Institute of France at a later period.

The result he arrives at, as respects these four years, is, that the number of earthquakes occurring at the Perigees (when the tides are highest and lowest) are, to those occurring at the Apogees, as 47 : 39,—a conclusion which, independently of the assumptions by which it is arrived at, must be as yet accepted with caution upon so narrow a base of induction, although possessing more than enough probability, from physical considerations, to induce further inquiry.

The Academy of Sciences (Paris) appointed a commission to report upon M. Perrey's communication; and the following translation of its report ('Comptes Rendus,' tom. xxxviii. 12 Juin, 1854) will give a tolerably clear notion of his views, which here rest upon a larger base than in his Memoirs as first published:—

"The Academy has commissioned us, MM. Liouville, Lamé, and myself, to draw up a report on a paper presented by M. Alexis Perrey, Professor in the Faculty of Sciences at Dijon, on the 21st March 1853, 'On the Connexion which may exist between the occurrence of Earthquakes and the Moon's Age,' and on a note also presented by him on the 2nd January last, 'On the occurrence of Earthquakes in connexion with the Moon's passing over the Meridian.'

"At the time of the presentation of the paper of March 1853, M. Arago had been appointed a member of the commission. The lamented death of our illustrious associate, since that date, left a vacant place in our commission; and before the presentation of the note of the 2nd January 1854, M. Lamé was appointed to it.

"M. Arago, whose attention nothing escaped which relates to the physics of the globe, pursued with sustained interest the researches of M. Alexis Perrey. The Academy has not forgotten the care which he constantly took to draw its attention to the notes which the learned Professor at Dijon addressed to him from time to time within the last few years, in consequence of the inquiries he was engaged in on the subject of earthquakes. M. Arago made particular mention, at several meetings, of the connexion which the author had already traced between the occurrence of earthquakes and the moon's age.

"The cause of the interest which belongs to this subject is easily explained. If, as is generally believed in the present day, the interior of the earth is owing to its high temperature, in a liquid or melted state, and if the globe has but a comparatively thin solid crust, the interior, being deprived of solidity, is compelled to yield, like the superficial mass of the ocean water, to the attractive force exercised by the sun and moon, and it acquires a tendency to swell out in the direction of the rays of these two bodies; but this tendency meets with a resistance in the rigidity of the solid crust, which occasions shocks and fractures of the latter. The intensity of this force varies, like the tides, according to the relative position of the sun and moon and consequently according to the moon's age; and we must also observe that as the tides ebb and flow twice in the course of a lunar day, at those hours which agree with the passing of the moon over the meridian, so the direction of the attraction exercised upon a point of the interior globe must change twice a day, according as the point recedes or approaches the

meridian, the plane of which passes through the centre of the moon. Without entering into longer details, we can easily conceive that, if the fusion of the interior mass of the globe plays a part among the causes of earthquakes, then its influence may become evident by a necessary connexion, capable of observation, between the occurrence of earthquakes and the circumstances which modify the moon's action upon the entire globe, or upon a portion of it, namely, its angular distance from the sun, its real distance from the earth, and its angular distance from the meridian of the place, or, in other words, the moon's age, the time of perihelion, and the hour of the lunar day.

"These considerations, which occurred to M. A. Perrey, doubtless inspired him with the idea of the two works which we have been commissioned to examine, at the same time that they assisted in attracting the interest of M. Arago and many other learned men to the results which he obtained; but they also suggest that the essential object of the inquiries on which we are commissioned to report ought to be, to ascertain the precise date, according to the lunar day and month, of every earthquake the record of which history has preserved, and even of each of the shocks of which these earthquakes consisted. We can easily imagine the immense toil which such a research would demand, and understand that M. Alexis Perrey having already devoted several years to it without bringing it to a termination, has yet been enabled at different intervals to obtain such partial results as M. Arago deemed worthy of the encouragement and attention of the Academy; and that the learned Professor at Dijon is impatient, before encountering the labours of still more years, to learn whether the Academy approves of the course which he has hitherto pursued. The necessity the author feels for the support and direction of the Academy explains why he has, upon several occasions, submitted to it results which naturally could not be complete, and which are not entirely so even in the paper and note which we are commissioned to examine. In the paper presented on the 21st March 1853, 'On the Connexion which may exist between the occurrence of Earthquakes and the Moon's Age,' the author has devoted the first chapter to the calculation and numerical changes of the rough results of observation.

"He has supposed four possible methods of calculation. In the first, already followed in the memoir presented to the Academy May 5, 1847, the author considers as a day of an earthquake each day upon which a shock has been felt, whether in a single country, or in two or more countries at the same or at different hours, separated from each other by spaces in which the motion was not experienced. Then noting, according to the knowledge of the period, to which day of lunation each day of earthquake corresponded, he arranges all the days which belong to the first day of lunation, then all those which correspond to the second day, the third, the fourth, &c.; and he constructs a table composed of thirty lines, each line indicating the number of earthquakes which belong to the corresponding day of lunation. Now these numbers vary one day with another, and they vary nearly in accordance with the same law, both in a table comprising a total of 2735 days of earthquake, the result of researches carried on during the years from 1801 to 1845, drawn up by the author and presented to the Academy May 5th, 1847; and in a new table containing a total of 5388 days of earthquake, embracing the result of extensive researches carried on from 1801 to 1850.

"In both tables the number of earthquakes corresponding to the days close to the Syzygies, is generally a little more considerable than that which corresponds with the days close to the Quadratures. In the second method

of calculation, the author regards earthquakes experienced in different regions separated by regions where the shock is not perceptible, as distinct one from the other, and reckons as an earthquake every percussion felt in a separate region. This new method of calculation increases the number of earthquakes in the 1st table from 2735 to 3041, and in the 2nd table from 5388 to 6596. The same law is again apparent in these two new tables and also in the four other tables which the author forms by dividing the half century between 1800 and 1850 into two intervals, each of a quarter of a century, and by successively applying the first and second method of calculation to the earthquakes of these two intervals.

"In the third method of computation, M. Alexis Perrey regards every shock of which an earthquake is composed as a distinct phenomenon, and registers it separately; but he does not possess the documents necessary for this plan because the number of shocks in each earthquake has not been accurately noted. The author has hitherto contented himself with considering in this manner the Table of 931 shocks felt in South America, chiefly in Arequipa published by M. Castelnau in the 5th volume of his 'Journey through the Central Regions of South America.' This table, without leading to result identical with those furnished by the other two methods, exhibits the fundamental relation already manifested. Lastly, in the fourth method of computation, the application of which would often be very difficult, and which has not yet been attempted by M. Alexis Perrey, we are to consider as an unique phenomenon the number of shocks consecutively felt in the same country during an interval preceded and followed in the same country by periods of tranquillity.

"To the nine tables formed by one or other of the three first methods of computation the author has added a tenth, formed by the first method. This only embraces four years, from 1841 to 1845, and contains but 42 days of earthquakes. In spite of this comparatively limited number, the proportion of the figures appears the same. In all these tables we observe a marked preponderance in the number of earthquakes which take place upon days close to the Syzygies, over those which occur at the Quadratures. However, it is but a general law which can be observed in the statement of figures of which the tables are composed; and there are numerous exceptions. In order to weaken the force of these anomalies, and more clearly to exhibit the fundamental law, M. Alexis Perrey divides the 29, 53 i. of which the lunation is composed, into 12ths, 16ths, 8ths,—and forms by proportionate calculations applied to the ciphers of his different tables constructed on the solar days, the numbers which correspond to each fraction of lunation; he displays in all these new tables (excepting some anomalies of detail) the law of the predominance of earthquakes at the Syzygies, and thus confirms more and more his conclusion, that, for half a century, earthquakes have been more frequent at the Syzygies than at the Quadratures. M. Alexis Perrey has also studied, in the more or less extensive registers which assisted him to draw up his different Tables, the question, whether there exists any connexion between the occurrence of earthquakes and the variable distance of the moon from the earth in traversing the different portions of her elliptical orbit. For this purpose he has calculated in each of his registers, and according to the different modes of computation employed to draw up the above-mentioned tables, how often earthquakes have occurred two days before and after, and upon the day of the moon's perigee and apogee; and he has shown, in the numbers thus obtained, that the total corresponding to the perigee, in which the moon is nearest the earth, is greater than that corresponding to the apogee, in which

she is at her greatest distance : then, in order to compare the results, he has taken the difference of the totals thus obtained and divided it by their sum, which has given him the quotients  $\frac{1}{16.5}$ ,  $\frac{1}{23.6}$ ,  $\frac{1}{23.5}$ ,  $\frac{1}{24.4}$ ,  $\frac{1}{18.6}$ ,  $\frac{1}{21.2}$ ,  $\frac{1}{10.75}$ , which are all greater than  $\frac{1}{30}$ , and the last almost equal to  $\frac{1}{10}$ .

"The apparent result from this is, that the difference between the unequal attraction exercised by the moon at her greatest and nearest distance has a sensible influence over the occurrence of earthquakes. In the note on the 'occurrence of Earthquakes in connexion with the passing of the Moon over the Meridian,' which he presented to the Academy January 2, 1854, M. Alexis Perrey discusses the question, whether the division of the shocks of earthquake during a lunar day is, like the tides, connected with the passage of the moon over the superior and inferior meridian. For this method of investigation he could only avail himself of the 824 shocks felt at Arequipa, which are registered with day and hour in the above-mentioned table of M. de Castelnau. By means of proportional calculations, which must have occupied a considerable time, he has calculated to which hour after the passage of the moon over the meridian, each of these shocks corresponds. He thus formed a 1st table (which he afterwards changed by dividing it into sixteen equal portions, grouped side by side, to form eighths) containing the 24 hours 50 minutes and a half of which a lunar day generally consists.

"By these two methods (notwithstanding some marked anomalies which could not but exist in so limited a number of facts as 824), the results obtained in both arrangements manifest the existence, in the length of a lunar day, of two periods of *maximum* for the occurrence of shocks, and two of *minimum*. The two periods of maximum occur at the hours of the passing of the moon over the superior and inferior meridians ; and the periods of minimum fall about the middle of the intervals.

"M. Alexis Perrey has thus succeeded, by the simple analysis of catalogues which he had previously drawn up, in proving, by three different and independent methods, the influence which the moon possesses in the production of earthquakes :—

"1st. That earthquakes occur more frequently at the Syzygies.

"2nd. That their frequency increases at the Perigee, and diminishes at the Apogee of the moon.

"3rd. That the shocks of earthquake are more frequent when the moon is near the meridian than when she is 90 degrees away from it.

"But the numerical tables from which these three propositions are derived, present some anomalies ; and the author has omitted nothing to endeavour to account for them, and to prove the law which is revealed at their first inspection. He first conceived the idea of constructing graphically the numbers contained in the tables, so as to obtain by the usual method a polygonal line analogous to those by which barometrical observations are usually represented, in which the eye catches at once the general course of phenomena in the midst of anomalies which tend to conceal it. We are tempted to regret that he has not further developed this graphical part of his work, which would have had the great advantage of displaying at a glance the direct result of his researches ; and that he has not even annexed to his memoir any of the lines which he constructed. But M. Alexis Perrey considered that he would obtain still more certain results by employing calculation ; and to this arduous task he devoted the 2nd Chapter of his principal paper, and the Second Part of his note of the 2nd January, 1854. It would be difficult for us to follow the author step by step in these analytical discus-

sions; we will restrict ourselves to the observation, that, in order to represent the result of his work, he has employed a formula of interpolation of this kind:—

" $\phi = M + A \sin(t + \alpha) + B \sin(2t + \beta) + C \sin(3t + \gamma) + \dots$ , in which  $M$ ,  $A$ ,  $B$ ,  $C$ , &c. are always coefficients of the same nature as  $\phi$ ;  $\alpha$ ,  $\beta$ ,  $\gamma$ , &c., are always angles, and  $t$  a variable angle dependent on the lunar motion, which will be equal to 0 degree for the new moon, to 90 degrees for the first quarter, to 180 degrees for the full moon, &c. He then adapts this formula to the numerical tables deduced from observation, and determines the particular truths which it contains. By means of the formula thus obtained, the author was enabled to draw up numerical tables corresponding to those deduced from observation alone, and in which the law of the phenomena appears disconnected from the principal anomalies which tended to obscure it in the first tables. The numbers contained in these new tables are carefully arranged, and form regular curved lines, in which the law is clearly manifest. These curves have a marked resemblance to each other, although they are not entirely alike—which could not be, for they are only approximative—and each bears the stamp of the group of figures which it represents. The resemblance of these curves is essentially increased by the fact that each presents two principal maxima corresponding to the Syzygies, and two principal minima corresponding to the Quadratures. We are thus brought back to the conclusion so evident by M. A. Perrey's toil,—that, for half a century, earthquakes have been more frequent at the Syzygies than at the Quadratures.

"The Academy fully conceives the importance of this conclusion, and appreciates the labour the author has taken to collect nearly 7000 observations on the first half of this century. This number, however, is very small for the solution of a question of this nature; and it is very desirable to have it increased, either by collecting all future observations from year to year, or by going back to past centuries, as the author has already commenced doing."

These views of Perrey have found support in the opinions enunciated by M. Zantedeschi as to the probable existence of a terrestrial as well as an oceanic tide, one in which the solid mass of the earth's crust, and the liquid or semiliquid nucleus beneath (if indeed it exist in any such state) is supposed to be an ellipsoid, with a major axis perpetually following the movements of the moon and sun. To what extent such a change of form is possible in the solid material of our planet under the constraint of the same forces that produce the oceanic tides (and whose elevations must in so far act against such change of form), it is for physical astronomy to determine. But even if its existence be admitted, and the change of level of a given point on the earth's surface were proved to amount to many feet—to far more, in fact, than the total elevation of the greatest ocean tide-wave, it is difficult to conceive how it even then could be a *direct or immediate* cause of earthquakes. Such change of form would be probably quite insignificant as compared with the earth's total mass; so that the flexures or changes of form produced by it in the solid crust would probably be far within the elastic limits of its materials, and, hence, the occurrence of fractures or dislocations due to such a train of causes impossible.

If it ultimately prove a fact that there is a real relation in epoch between earthquakes and the ocean tides, or the moon's and sun's position in respect to the earth, the phenomena will probably be found in relation, only through the intervention of changes in terrestrial temperature, or in the great circu-

lations upon or within our planet, of its electrical, or magnetic, or thermic currents, or the conversion of these into each other reciprocally, and not to the direct action of the variable attractive forces of our primary and our satellite. To some such conversions of force into heat, developed at local foci, it would appear much more probable that all volcanic phenomena are due, than to a universal ocean of incandescent and molten lava beneath our feet, with a thin crust of solid matter covering it, the present or historical existence of which is not only not proven, but for which no argument of weighty probability has been, as I conceive, advanced.

In the present state of our knowledge of the obscure relations between the internal mass and actions of our planet with the cosmical forces that act upon it both within our own atmosphere and from the abysses of space beyond, and in our comparative ignorance even of the terrestrial phenomena themselves, no speculation, however hazardous or hardy, that is based upon a natural hypothesis, need be regretted: such views in the beginning of every separate road of inductive science are eminently suggestive, and, although in themselves false, may point towards truth. It is only in this aspect that a memoir by Dr. C. F. Winslow, M.D., 'On the Causes of Tides, Earthquakes, Rising of Continents, and Variations of Magnetic Force,' requires notice. The communication appears to have been made to the Academy of Sciences of San Francisco, California, by the author, in 1854 or 1855. I have met with it only through a printed copy, for which I believe I am indebted to the author.

That our satellite *does* actually influence the magnet *directly*, has been discovered by Herr Kreil, of the Vienna Royal Observatory (see 'Phil. Trans.,' 1857, and 'Proc. Roy. Soc.,' vol. vii. pp. 67-75). General Sabine, in the introduction to vol. iii. of 'Magnetic and Meteoric Observations made at Toronto,' p. 9, states—"The decennial solar period of ten or eleven years, in connexion with the solar spots, proved to connect itself with the magnetism of the earth, but *not* with other cosmical phenomena" (see 'Phil. Trans. 1852,' Art. VIII.); that is to say, I presume, not with such cosmical phenomena as have had their laws already ascertained. Again (p. xi.), the author adds—"The solar diurnal variation appears to be wholly irreconcilable with the hypothesis which attributes the magnetic variation to thermic causation."

We find, then, that both sun and moon influence, with other and more occult forces than those that address sense and eye, our planet, and that these all incessantly modify the conditions and relations (mutual and to things on the surface) of every grain of matter in the inmost recesses of its nucleus. While every cosmical force is thus, as soon as its laws are discovered, found to be correlated to every other, all mutually convertible, and capable of disappearing and reappearing "by measure, number, and weight," as mere brute power or mechanical force, it is not too much, at least, to affirm the advancing probability, that a distinctly (though irregularly) *periodic* phenomenon, such as earthquakes, will be found intimately related to them, possibly with no very long or intricate intermediate chain of causation.

As regards the periodicity, &c., of those solar spots which admit of consideration in relation to the two paroxysmal maxima and two minima in each century (noticed hereafter), Humboldt may be referred to ('Cosmos,' vol. iii. p. 291). Schwabe of Dessau, whose works the illustrious author quotes, observed the solar spots from 1826, and, during the whole period, found three maxima (average number 300,) and two minima (average number 33,) the period being about ten years, or the tenth part of a century. Wolf of Berne ('Comptes Rendus,' vol. xxx.) considers the period of the minima as de-

finite, but that the maximum varies, being on an average five years after the minimum, and that nine minimum periods exactly make up *each* century; adding, that all the notable apparitions of solar spots on record agree with this rule. Other papers on this subject will be found, with details in the 'Ast. Nach.' and 'Pogg. Ann.' from 1850; and in 'Silliman's Journal,' vol. xxv., some remarks of Reichenbach are worthy of attention. He observes that the period of Jupiter is 11.86 years, and that there are certain coincidences between the planet's periodic returns and those of the solar spots,—adding that their conjoint magnetic effects upon our planet, in relation to the magnetic periods above referred to, cannot but be great. See also 'Gilbert's Annalen,' vols. xv. and xxi., for Ritter's memoirs on the subject; and "Hansteen on the Relations between Earthquakes and the Aurora," in 'Bull. de l'Acad. de Bruxelles,' 1854, t. xxi.

I am myself indebted to my friend Dr. Robinson, Astronomer Royal, Armagh, for much of my information upon the subject, which connects itself with our own in relation to the preceding reflections, and through the singular point of coincidence as to periodic recurrences in both—the one presenting traces of being in time a submultiple of the other. But at present this must all be taken for what it is worth, *and no more*.

It may be suitable to remark here, that the movements of the inclination magnetometer as well as of the barometric column, of which several have been of late years recorded as occurring at the time of earthquakes, are most probably merely mechanical and due to the shock movements direct. This has been ascertained by Kreil at Vienna, and Padre Secchi at Rome (see also Perrey's 'Mém. Europe and Africa,' p. 11); and such appears to have been Humboldt's view (though expressed with some qualification) at the date of publication of 'Cosmos.'

The following is a translation of Zantedeschi's expressions of his own views as to the occurrence of a terrestrial, or rather *terrene tide*, probably better named, if it exist, *the elastic tide*:—

"On the Influence of the Moon upon Earthquakes, and on the Consequences probably derivable as to the Ellipsoidal Figure of the Earth and the Oscillation of the Pendulum. By M. F. Zantedeschi." *Comptes Rendus, Séance du 2 Aout, 1854.*

"I have thought for a long time that the form of the earth cannot always be the same, but that it presents an incessantly changing elliptical form, that is to say, having a continued tendency to become protuberant in the directions of the radii vectores of the two luminaries which attract it, the sun and the moon. I have always believed that a direct proof of it might be obtained by determining a point in the heavens at the epochs of the spring tides, and at that of the Quadratures. This point must appear lower at the epochs of the high tides and of the Syzygies. The Imperial Observatory of Paris, with the means that it has at its disposal, could prove if this difference be observable, and especially now, that, thanks to the labours of M. Froment, dividing has been made so exact as to admit of measuring with the greatest precision a difference of  $\frac{1}{1000}$ th of a millimetre between two consecutive visible horizontal lines.

"I have always assumed that a compensation pendulum of such a length that it exactly beats seconds at the epoch of the quadratures and of the neap tides, must beat more slowly at the epoch of the spring tides, from the transit of the moon over the meridian of the given place, and at the epoch of the syzygies; and, taking from this fact that the variations of the force of attraction upon the mass of the earth are continuous, I have concluded from it the necessity for astronomy to take account of these times; and



herein I find the explanation of certain leaps of astronomical clocks of which the learned have not hitherto been able to discern the cause. I believe that one day we shall have the equation of time in functions of the variations of intensity of the planetary attractions, and of the regular oscillatory movements of the earth, as we now have the equation of time in functions of the motions of translation and of rotation of the earth itself. I say the *regular* oscillatory motions, because, as for the irregular movements, we cannot submit them to rule, and we are enabled to account only for the extraordinary concomitant phenomena presented by the atmosphere, by the earth, and by certain species of animals. The irregular motions which we call earthquakes, happen more frequently, it has been observed, either at the epoch of the Syzygies rather than at the epoch of the Quadratures, or oftener at the epoch of spring tides than at that of the neaps. This important observation is found in the works of Georges Baglivi and Joseph Toaldo.

The first, in his '*Storia Romani Terræ Motus, anni 1703,*' says, "*In singulis lunæ aspectibus, seu quadraturis, potissimum in plenitudine ejusdem seu totali oppositione cum sole, certo succedebant terræ motus, frequenter paululum præcedebant ipsos aspectus.*"—Georgii Baglivi Opera Omnia, Bassani, 1737, p. 415, Editionis Venetiarum, 1752, p. 326.

Toaldo, speaking generally of earthquakes, says, "the late M. Bouguer in the account of his voyage to Peru speaks much of earthquakes, so frequent in that country. He mentions with doubt the assertion of a Peruvian 'savant,' that earthquakes have certain fatal and marked lines when they occur at low water. On the other hand, Chauvalon, in his voyage to Martinique, notes particularly the earthquakes which took place at the time of high water; and the earthquake which destroyed Lima on the 23th of October, 1746, occurred at three o'clock in the morning, at the instant of high water (*ora della prima acqua*). Thus we remark in other countries that these phenomena may themselves depend on the cosmical causes of the action of the sun, and especially of the moon." (Giuseppe Toaldo, '*Della Vera Influenza degli Astri, etc., Saggio Meteorologico,*' Padova, 1770, p. 190.) I hope that the Academy of Sciences will well receive these documents and these ideas, which tend to augment the merit and the value of the very important studies of M. Perrey.

Edmonds, also, has endeavoured to show that many formidable earthquakes are found to have occurred the day after the moon is in her first quarter ('*Journ. Polytec. Soc. Cornwall,*' Note 158; Sabine's '*Cosmos*').

Before dismissing the subject of other earthquake catalogues, the following labour as to Indian earthquakes should be noticed. In the '*Journal of the Royal Asiatic Society,*' vol. xii. n. s., for 1843, Lieut. R. Baird Smith, B.E., made one of the most extensive contributions to our slender stock of oriental earthquake annals. He divides India into nine earthquake tracts, partly on physical grounds, partly arbitrarily, viz.—

1. Central Himalaya;
2. Lateral Himalaya, including—
  - a. Cabul,
  - b. Jellallabad,
  - c. Cashmere,
  - d. Nepaul,
  - e. Assam;
3. The Solymaun Mountains,
4. The Aravulli Mountains,

5. Delta of the Indus,
6. The Vindhya Mountains,
7. Delta of the Ganges,
8. East Coast Bay of Bengal,
9. Eastern Ghauts;

and under these divisions describes more or less fully a total number 162 earthquakes, which he finally tabulates, by date and place only. The epoch of his catalogue commences nominally at A.D. 1505; but almost the whole of the catalogue refers to the 19th century, and comes down to the year 1842.

After his remarks upon the earthquakes of the first region (p. 1039), he observes, "The hot springs, I believe, owe their high temperature to internal chemical action extensively distributed; and the earthquakes are due to the convulsive efforts of the elastic matter generated by this action, escaping from the interior of the earth." . . . "To define the nature of this action, while ignorant of the chemical nature of the springs, would be vain;" . . . but . . . "I cannot resist the conviction that both are due to one and the same origin." . . . "There are no active volcanic vents yet discovered in the Himalayas, but abundant hot springs and trap dykes, are evidences of disruptive action."

In the same vol. p. 741, a translation, by A. Sprenger, of the Arab MS. in the Imperial Library at Paris, of a work of As. Soyuti on earthquakes, is given. The original work is entitled, 'Kashf as salsalah' wass az Zalzalah,' i.e. "a clearing up of the history of earthquakes." It contains a catalogue of about 120 earthquakes in Western India, Persia, and Caubul, and extending to Arabia, Syria, and Egypt. It certainly, however, scarcely warrants its title, and contains few facts of scientific value.

Again (p. 907), a small catalogue of earthquakes in Upper Assam occurs—the authors, Capt. Hannay and Rev. N. Brown. The chief statement of importance to be found in it is their opinion, that in this region the horizontal direction of shock seems to be mainly from S.W. to N.E.

Since the publication of former 'Reports,' some monographs of single earthquakes have appeared; but reference is here only to catalogues.

While these sheets have been passing through the press, the work of Dr. Otto Wolger, with catalogues of the Swiss earthquakes, has appeared, and demands notice for the extreme accuracy and care with which the volume has been produced,—'Untersuchungen über das Phänomen der Erdbeben in der Schweiz,' von Dr. G. H. Otto Wolger, Gotha 1857, 1858, 3 vols. 8v. The first, "Chronik der Erdbeben in der Schweiz," also embraces a discussion as to the periodicity, locality, and extent (Ausdehnung) of the Swiss earthquakes, with the results graphically reproduced.

The second contains the geology of the Canton of Wallis, in which great a number of rapidly recurrent feeble shocks have been so long recorded.

The third, 'Geschichte der Erdbeben (im Wallis) des meteorologischen Jahres 1855,' together with a chronicle of those in the Swiss Cantons and adjacent parts of France.

There is an excellent though small map of the Canton of Wallis, showing the points of observation of the many small shocks that have become identified with the name of Pignérol as a centre—and in several instances showing the horizontal directions observed—which quite bear out the observations before found further on, as to the effects of surface in perturbing the general emergent direction of the wave of shock.

The work of Dr. Wolger is entitled to the study of physical geologists.

Perhaps, like most men who carefully and lovingly perfect their subject, he attaches a too preponderant value to the limited district of which he treats.

Having so far considered the labours of others as to the distribution of earthquakes in time, some remarks remain to be made on their distribution in space by foreign authors. The seismic map of Berghaus in his 'Physical Atlas,' is the most important attempt of this sort emanating from abroad. The following are Perrey's remarks upon this map ('Mém. de l'Académie des Sciences de Dijon,' t. iv. année 1855, p. 57):—

"M. Berghaus, of Berlin, has devoted map No. 7 of the geological part of his beautiful Physical Atlas to volcanic and seismic manifestations. Greenland is very slightly coloured, and is included in the circumference of a circle of percussions, the centre of which is in Iceland. This statement does not appear to me to be at all supported by facts. The author appears to have outstripped observation; for the commotions in Iceland constitute an almost local phenomenon; rarely ever is the island simultaneously shaken in its entire extent, and the shocks are only of moderate intensity."

It may be added, that observation points out that the connexion as to earthquake commotion is between Iceland and Norway, and not between Iceland and Greenland. Of the latter country, however, in this respect we know but little.

As to Greenland, I do not know whether any earthquake has occurred there but that of November, 1755. That was violently felt; it caused a terror so much the greater, as shocks of this nature were completely unknown. However, it is probable that they are occasionally felt.

The 22nd of September, 1757, there was a violent hurricane, the wind from the south, accompanied by hail and rain; the lightning was terrific, but without thunder. It was generally believed that a shock of earthquake was felt. (Prévost, 'Hist. Gén. des Voy.' t. ix. pp. 23 & 209.) Earthquakes, the author adds, are rare in this country.

Two years after, in September, 1759, at New Herrnhut (Greenland), the house of Siehlfels experienced shocks like an earthquake, although it was very low and had walls four feet thick. The houses around suffered severely: the roofs were split; and the boats drawn up on shore were carried away by the hurricane, which was felt at a distance. This storm was preceded and followed by igneous meteors, one of which set fire to the house. On Christmas Eve a similar phenomenon occurred at noon. (Prévost, *l. c.* t. xix. p. 208.)

These are the only facts that I can quote relative to this country, which, I repeat, notwithstanding its contiguity to Iceland, ought not, in my opinion, to be placed within the sphere of the volcanic and seismic action of that island.

M. Berghaus has marked the Azores and Canaries with a darker shade; and this memoir will contribute to confirm the author's idea of also colouring the Archipelago of Cape Verd and the Antilles. But it leaves all the rest of the basin uncoloured; and surely it is difficult not to admit some shading, however slight, in latitudes distinguished of late by M. Daussey. Let us again repeat, that earthquakes, which ought to form an important part in the study of terrestrial physics and physical geography, have hitherto been too much neglected. They have been resigned to geology, to which, in my opinion, they only indirectly belong.

But to continue, on M. Berghaus's map, a very dark shade, which the note I published in our last 'Memoirs' does not justify. Yet the

illustrious physicist whom I have just quoted includes the Azores and Canaries in the seismic region of the Mediterranean.

They would seem to form the western part of an axis which extends to Hindostan with variable shades, and thus unites the Atlantic with the great volcanic chain of the Sonde (Sunda), which, as we know, is connected by the Japanese and Kurile Islands with the Aleutian Archipelago, and by this chain to the grand volcanic range of the two Americas. This idea is ingenious, but is it true? It is a point that I cannot at present discuss. Yet we must admit that the Azores, and even the Canaries, seem to form a part of the sphere of subterranean convulsions, the centre of which is almost parallel to Lisbon; and to be at the western extremity of that great seismic zone which proceeds by the peninsulas of Spain, Italy, and Greece, to the volcanoes of Asia Minor, and which there joins the central chain of Asia. It is, in fact, within this zone, extending towards the north as far as the Carpathian Mountains, that the principal centres of earthquakes and the most remarkable seismic axes in Europe are to be found. Extending to the west along the 40th parallel, this zone reaches the United States of America, where it embraces New York and Boston, which M. Berghaus has perhaps marked with a rather too dark colour, though earthquakes are not rare there; and thence it proceeds to Kentucky, Tennessee, and Missouri, where the phenomena of the year 1811 demand a darker shade in M. Berghaus's beautiful map. M. Berghaus draws a linear region in Arabia, from Medina to Yemen, along the east coast of the Red Sea. Can this be a partial axis of convulsion? Is it independent of the Mediterranean zone? Or is it united to it by a second axis—the Syrian axis, parallel to the east coast of the Mediterranean? But the countries near to the Isthmus of Suez appear little subject to earthquakes; can there be a solution of continuity between these two axes? or does the space which divides them, and where the phenomenon has, so far, been so rarely remarked, constantly present a peculiarity verified more than once in America? In the New World (at Caraccas, for example) certain regions of small extent have been observed to enjoy a complete calm while the neighbouring country experienced frightful catastrophes.

The historians of these disasters have characterized this unconvulsed part of the soil by a picturesque expression, namely, "a bridge has been formed." The probable physical explanation of this phenomenon of "the bridge" has been given in a former Report (2nd Report, p. 309), by the author of this, based upon the view that *total reflection* of elastic impulses may occur under certain suitable conditions.

Perrey continues, "No simultaneous convulsions at both extremities of this Syro-Arabic linear region have been recorded. However, if we recall that the Himalaya Mountains are very subject to subterranean convulsions; that the Alps, and especially the Pyrenees, are frequently shaken, the Caucasus-range still oftener, and that the Andes are almost always in a state of commotion; must we not regret that we possess no information concerning the phenomena in the high Ethiopian chain? is it not to be desired that travellers in Africa should make observations upon a matter so interesting to science?"

"During the last few years Abyssinia (strongly marked in M. Berghaus's map) has been the study of numerous French explorers. Several narratives of their vast and useful labours have appeared; but I do not find one word about earthquakes! The Academy of Sciences has just given new instructions to M. Rochet (d'Héricourt), about to undertake a third expedition to that country; and the phenomenon is not even mentioned by M. Duperrey!

Quite recently, again, I felt the same painful surprise at reading the instructions given to M. Raffenel.

"Does Abyssinia form an axis of convulsion perpendicular to the Arabic axis? or is it the eastern extremity of an unique axis formed by the great Ethiopic chain, and crossing the African continent at its greatest breadth?"

"In nearly the same latitude as Abyssinia, but on the western coast of Africa, we find the sources of the Senegal and Gambia vividly coloured in M. Berghaus's map. What evidence has the author for this statement? With respect to this region, I am only acquainted with the two following descriptions drawn from M. Walcknaër's collection." We read, at t. vi. p. 181, "The aspect of the mountains Nikolo and Bandeia prove that this country has been the theatre of volcanic eruptions. Earthquakes are very frequent; and shortly before M. Molliou's visit, one of the most violent had occurred, the shocks of which had been felt as far as Timbo." And further on, p. 184, "The mountains, covered with ferruginous stones and cinders, which enclose the valley in which are the sources of the Senegal and Gambia, lead M. Molliou to believe that they occupy the crater of an extinct volcano. This traveller was at the source of the Gambia, April 8, 1818."

It is useful to compare this passage with the following, extracted from the same collection, t. xii. p. 356:—"There is no record in Senegal that any portion of the colony has ever experienced an earthquake."

Without seeking to justify the accuracy of M. Berghaus, it may not be uninteresting to remark that the Antilles and the Republic of Guatemala lie under the same parallel of latitude (about 15° N.) as Abyssinia and the sources of the Gambia.

Can there be an axis, or rather an immense zone, of convulsions parallel to the Equator? Often convulsed in the western counterforts (the Archipelagos of Cape Verd and the Canaries), Africa suffers also in the S.E., in the great southern chain of Madagascar. I find in M. Seguérèl de la Combe that "earthquakes are very frequent in Madagascar. When they occur, the natives leave their houses and commence beating the walls with their hands. They do not allege any reason for this conduct but custom." ('Voy. à Madagascar et aux Iles Comorres,' t. i. p. 3.)

Let me add this remark from an ancient traveller in Madagascar: "Happily earthquakes are here completely unknown." (Le Gentil, 'Voy. dans les Mers de l'Inde,' t. ii. p. 367.)

If we subjoin to these contradictory statements the few facts which we possess, we shall justify M. Berghaus's not having coloured the south of Africa.

"1786, August 4, 6:35 A.M., in the Isle of France, two violent but harmless shocks. The motion was horizontal and vertical. The barometer was not affected. Earthquakes are of rare occurrence. The volcano in Bourbon, active from the 5th of June previous, emitted much lava upon this day, but the island was not sensible of any shocks." (Péron, 'Voy. aux Terres Australes,' 2nd edit. t. i. p. 134; 'Ephémér. de Manheim,' 1788, p. 397.)

"1809, 8th of January, the island of Penguin, close to the Cape of Good Hope, was swallowed up by an earthquake. I am unacquainted with this island, and I only find this circumstance related in an anonymous work entitled 'Mémorial de Chronologie,' t. ii. p. 932.

Here, again, relative to another earthquake of the same year, 1809, are the details communicated by M. Barchers, Minister of Stellenbosch (country of the Hottentots), to Campbell (end of November 1812), concerning the first of the earthquakes which occurred three years previously:—

"The church of Paarl was then vacant. The governor begged me to preach

there once a month. On Saturday, the eve of the day on which I had to go there, I felt extremely ill and dejected. On Sunday morning my wife and I set out. When I reached Paarl, I was very weak, and asked for some water; but it was lukewarm, and I could not drink it. I was told it had been brought from the fountain. I sent my slave, but what he brought was hot. I went thither myself, and found it was really the case. We could not imagine the reason. Whilst I was preaching, I felt so giddy that I scarcely knew what I was saying.

"After the sermon, I spoke of this sensation to several of my friends, who declared that they also experienced it. We returned to Stellenbosch on the following morning. The whole of that day my family and servants and myself felt very unwell; the dogs also shared in our uneasiness.

"At 10 o'clock we were all alarmed by a noise like that caused by numerous carts rolling through streets. We did not know what it was; but all my family were terrified. A great light shone into the room. Supposing that a thunder-bolt had burst, I exhorted them not to be alarmed, as the lightning had passed, and the danger was gone. Whilst I was speaking, the same noise which we had just heard was again repeated, and we all trembled. 'Oh!' cried I, 'tis an earthquake; let us all go into the garden.' We felt, to use a Scriptural expression, that 'there was no more life in us.' A third shock followed; it was less violent than the first two. The noise was dreadful, not only owing to its loudness, but also to its nature. I can only describe it as a sort of groaning, or piteous howling. The dogs and birds testified their fear by their cries. The night was calm, not a breath of wind stirred the air; but I remarked a number of luminous meteors. I observed small clouds in various quarters, but their aspect presented nothing new. Every one endeavoured to keep close to me; alarm was excessive; I said what I could to allay it. At last we ventured to return to the house, and endeavoured to sleep to recover ourselves; but the effort was vain." (Walckenaër, 'Collect. des Relat. de Voy. en Afrique,' t. xviii. p. 275.)

1810, in the depth of winter an earthquake occurred at the Cape of Good Hope.

1811, 2nd June, five minutes before 12 o'clock noon, another earthquake took place. The heat was greater than usual at this season, the thermometer was 16°·8 R. A thick mist filled the atmosphere, yet did not obscure the sun's rays; not the least breeze disturbed the air. The inhabitants, who greatly dread subterraneous shocks, were reminded by these symptoms of the earthquake of the preceding year. M. Burchell was busy indoors with preparations for a missionary journey, when suddenly a noise like an explosion shook the entire house. Three or four seconds afterwards a second peal like thunder produced another shock; at the same instant a singular motion and vacillation in the atmosphere was apparent, whilst the sky continued perfectly serene. M. Burchell ran out to discover what had occurred; he saw all the inhabitants running out of their houses in great alarm, pale and trembling, not conscious what they were doing, the women either screaming with terror, or motionless and incapable of speech. After the second shock, the trembling of the atmosphere had ceased, and the temperature a little cooled. The people gradually regained their composure, observing that no more shocks followed. Many houses were injured, and walls split.

This earthquake took place five minutes before noon, during the Cape winter; the preceding year it occurred during the night, in the height of summer: so this phenomenon is not limited to any time of day or year.

M. Burchell saw the trace of electricity in all the preceding symptoms, and can only explain the earthquake as an explosion of electric matter.

On the morning of the 19th another shock was felt, but unaccompanied by explosion or other consequences. A slight sound was heard, which appeared to travel from N. to S., and lasted about three seconds. (Walckenaër, *loc. cit.* t. xx. p. 20-22.)

To these facts we may subjoin the following :—

1811, 7th June, at the Cape of Good Hope a violent shock of five minutes; the houses tottered, and even the vessels in the bay felt the shock. (J. D. 14th Nov.; M. U. 15th Nov. 1811.)

1818, on the night between the 28th Feb. and 1st March, in the Isle of France, a hurricane similar to that of 1716; it is alleged that shocks of earthquake were felt. (J. D. 21st June 1818.)

1821, 9th March, in the Island of Bourbon a slight shock. The eruption of the volcano, which had commenced on the 28th February, still continued. (C. P. t. xxxiii. p. 404; Garnier, *Météor.* p. 124.)

1840, 7th July, in the Isle of Bourbon, earthquakes recorded without detail by M. Meister in the *Annalen für Meteor- und Erdmag.*, 1er cahier, p. 161.

1844, 21st Feb., 8 P.M., in Isle of Bourbon, shocks and terrible wind (communic. de M. Meister.)

If we add to these five or six earthquakes the eruptions of the volcano in the Island of Bourbon in 1708, -51, -66, -74, -86, -87, -91, -93, and 1800, we shall have all the manifestations which I can quote of the interior activity of the globe in the south of the African continent. So this part of Africa appears little subject to subterranean commotions. But is it the same with the interior of the country? It would be very interesting to learn this.

Johnston, in his Seismic Map (Phys. Atlas, No. 7, Geol.), lightly tints the southern extremity of Africa, left untouched by Berghaus.

To these remarks of Perrey may be added, that both Berghaus's and Johnston's seismic maps alike labour under two most important defects.

First, a hard and rigid line, often of an extremely irregular figure, limits strictly and definitely the supposed boundary of seismic commotion in each assigned region. Two physical misconceptions are involved in this: first, that forces emanating from a centre, of the nature of earthquake shocks, can have any definite boundary; secondly, that a line drawn upon the earth's surface around any centre of impulse, and through a number of points at which the horizontal elements of shock are alike (suppose those at which these elements become insensible without the help of instruments, which would be the boundary line in a popular sense), can possibly have, when embracing large areas, a highly irregular though closed curvilinear figure. The curve traced through such a line of points must circumscribe a space either nearly circular or slightly elliptic; all irregularities due to variation of surface vanish over such vast spaces.

Irregular curved areas are alone possible on the assumption of more than one impulse propagated from the same origin simultaneously, of which we have as yet no evidence.

The second defect common to both those maps, and possibly difficult to be avoided from their small scale, is the absence of any positive and invariable, though conventional principle of application of the *depth of tint* in colouring, which shall determine, by its depth, the intensity and frequency of seismic action at given centres.

The principles adopted with the seismic map attached to this report will be explained further on.

Berghaus's maps (3 Abtheil. Geol. No. 7 und No. 9) give an exceedingly imperfect notion of the whole east of China, and indeed of the Sunda

and Philippine Island groups, including Luzon, incomparably the most important and interesting earthquake region on the face of the earth. Berg-haus's maps, 3 Abtheil. Geol. No. 8 und 10, "*Specialia vom Vulkan Gürtel*," &c., are worthy of all commendation, save as respects the outline of seismic regions already adverted to, and here repeated even in a more distorted form.

Such have been the results of previous labours as to the distribution in time and space of earthquakes. I proceed to those deduced from our own researches.

At the conclusion of the Second Report (1851), the principles upon which the British Association Earthquake Catalogue itself was compiled have been described; it remains now to describe the methods by which it has been discussed, and to state the results.

The collection of an earthquake catalogue is a work essentially of a statistic character, and partakes of all that disadvantage and incompleteness that belongs to the collection of facts not the result of choice and experiment, but presented to us, through various and imperfect observations, from many places and through long-lapsed periods, during which all the conditions of observation have suffered much change, so that the facts that are presented for record, and those of which no account is given, are alike subject to certain contingent or accidental modifying conditions, but of such a nature as to defy our making them part of our discussion.

So in a work which proposes to collect under one view the transmitted observations of the whole human race, and of all historic time on this particular subject, the conditions of human observation itself enter into the results, and our earthquake record is at once an account of these phenomena, and of the rise, progress, and extension of human knowledge and observational energy, and also of the multiplication and migrations of the human family and its progress in maritime power; in a word, at every moment the indeterminate extent to which man has fulfilled his great destiny of "*replenishing the earth and subduing it*," affects every continuous record of his observations or his arts.

The method of discussion followed was that of numerical analysis as to time, and topical analysis as to space, from which curves graphically representing the results have been projected by the usual methods.

One conventional arrangement has been found inevitable. It refers to the cases of long-continued slight shocks or tremors, occurring almost daily, as at Pignerol in 1808; St. Jean de Maurienne in 1839; Comrie, in Perthshire, 1839-1847; and Ragusa in 1843-1850. In these the slight shocks recorded for each month of the disturbed period are grouped as forming one earthquake at the locality. Had not some such arbitrary rule been adopted, these comparatively insignificant, though frequently repeated exhibitions of seismic force (if they be such) would, when introduced in the curves, have given, at certain points of time, a false elevation to the abscissæ, while the phenomena themselves are not of a character materially to modify our results even if excluded.

The conclusions possible from the still vast mass of facts here brought together, however, will, as a first generalization, be found, I apprehend, not unimportant.

They may be classed under two great heads; viz. the relation of seismic energy to time and to space, or the distribution of recorded earthquakes in each. And, first,—



*Of Seismic Energy in relation to Time.*

Plates I. II. III. IV. V. and VI. carry down the stream of time the whole series of observations from 2000 years before the Christian era to the year 1850.

In all these chrono-seismic curves the ordinate is that of *epoch*, and must not be confounded with one expressing in anywise the duration of each shock or separate seismic effort. The abscissa is that of seismic intensity, which has been assumed proportional to the number of coincident seismic efforts, without taking any account in the curve of the variable intensity of different efforts. This is a source of uncertainty that would not have been avoided, but rather the tendency to error increased, by any conventional law of enlargement of the abscissa that could have been devised to suit the vague proportion of greater or less in earthquake narrations; but the means are given to the reader of applying such corrective as the information admits, by placing along the line of time down to the year 1750 the letter G above each epoch at which an earthquake of undoubtedly great and destructive intensity has been recorded, and the letter S above all those that were so circumstanced as to have been followed by the influx of "great sea waves." This notation might have been carried on further, but that after the year 1750, when observations rapidly multiply, the number of earthquakes recorded as being "great" are so numerous, that to distinguish their epochs thus would have involved the extension of the ordinate to a new and inconveniently enlarged scale. For the first three centuries of historic time (according to our commonly accepted chronology) it will be seen that there are no earthquake records, and that, while between A.C. 1700 and A.C. 1400 there are a few scattered facts, there is again from A.C. 1400 to A.C. 900, nearly a period of five hundred years of perfect blank, followed again (with a few exceptions) by another blank from A.C. 800 to A.C. 600. Even in the succeeding century, but two earthquakes are recorded; so that, in fact, the record of any value for scientific analysis may be said to commence at the five hundredth year before the Christian era.

It is only in the first century prior to our era that the curve shows that observations may be at length deemed even continuous, every previous century being interrupted by lengthened lacunæ.

From the commencement of the Christian era downwards to the present day, the abscissæ continually increase in closeness and magnitude, and at the first casual glance suggest the idea that earthquake energy has increased over the whole earth during the course of ages in a fearful manner. We shall see, however, reason to correct any such conclusion.

Although periods of thirty and forty years occur in the second and third centuries of our era without the record of a single earthquake, it did not seem advisable to affirm as certain the want of all observation, by the substitution here of lacunæ for the continuity of the curve.

The end of the third century first gives evidence of numerical increase; and the increase thence is steadily progressive up to the year 1850.

It is not, however, until the seventeenth century that the increased number of earthquakes becomes strikingly remarkable, increasing still more in the eighteenth, and presenting a far greater number in the first half of the nineteenth than in both the preceding centuries taken together.

Yet this vast and rapid expansion, in the three last centuries especially, affords no proof whatever that there has been a corresponding, or even any increase in the frequency of earthquake phenomena. Our chrono-seismic curve is, in fact, not only a record of earthquakes, but a record of the ad-

vance of human enterprise, travel, and observation. The epochs of printing and the Reformation are those of the first great expansion, while the discovery of the new world, the voyage to India round the Cape, and the vast accessions of European colonization and commerce of the last 150 years, connect themselves as causes with the two latest curves. We have traced at once the history of a physical law and that of human progress. How far, then, is it possible to disentangle these elements, so as to arrive at a conclusion as to whether seismic energy over the world is progressive, constant, or retrogressive? To do so perfectly is perhaps impossible; the elements by which the rate of observational knowledge has been determined are too complex and too imperfectly known to render any attempt to fix its rate of expansion in time probable. Even the area of observation itself, the land and water known to history at given epochs, can be but vaguely sketched; as vaguely also the number of observers, and the determination of the human mind towards observation. (See Appendix I.)

This much is certain, however;—that up to, and even beyond the Christian era, no record of earthquakes exists for any portions of the earth's surface, except for limited areas of Europe and Asia, and a still more restricted patch of Northern Africa, and, if Kaempfer is to be credited, for Japan, of which, however, we know nothing for certain. Yet, of the enormously larger areas of the then outer and unknown world since discovered, it is not to be supposed but that there was a proportionate (perhaps even for the "New World" a more than proportionate) amount of earthquake energy, though not recorded or even known to mankind.

If, however, the curve of total energy (Plate VII.), in which the facts of all the preceding are condensed into a single line, be examined and compared by a broad glance with the great outlines of human progress, the conclusion appears sufficiently warranted, that during all historic time the amount of seismic energy over the observed portions of our world must have been nearly constant. To assume that earthquake disturbance has been continually on the *increase*, would be to contradict all the analogies of the physics of our globe. These analogies might lead us to suppose that, like other violent presumed periodical actions, they were getting spent, and that the series of earthquake shocks would be found a converging one. Were this so, however, to any considerable extent, we should not find the vast expansions of results which the last 300 years present; or, although the expansion might be absolutely large, its divergence would not present such decisive features of progressive increase. The results due to the number of observers would be more or less balanced by the increasing paucity of events to observe and record; but this appears conclusively to lead to the deduction we have made, namely, that if the curve of total energy be closely examined century by century, it will be found that, at periods of social torpor and stagnation of observational energy (and this is so even far down the stream of time), the number of earthquakes remains nearly constant, or with a very slight but nearly uniform increase. Thus, from the eleventh to the beginning of the fifteenth century, the abscissæ are almost equal, the crests of the curves being nearly all ascribable to single great earthquakes, which made themselves felt over vast areas. Their expansion just keeps pace, so far as can be judged, with that of contemporaneous human progress; but if the series was really a distinctly converging one, at such periods we should find the abscissæ decreasing also. On the other hand, we find the increase in the number of recorded earthquakes always coinciding with the epochs of increased impulse and energy in the march of the human mind.

We therefore conclude that our evidence, such as it is, indicates a general

uniformity in the occurrence of earthquakes as distributed over long epochs of time. Setting aside (as contradicted by all other sources of analogy and information) the supposition that this, or any other phenomenon of occasional disturbance, has an increasing development upon our planet, we have two remaining alternatives;—either that seismic energy is getting gradually spent and is dying out—this, the evidence before us appears sufficiently to contradict; or that, upon the whole, during our short and most imperfect acquaintance with it, it has remained pretty uniform throughout historic time, taking one long period with another. Yet, could we extend our view beyond the short limit of man's history to the vast past duration of that of our globe itself, it might be found that seismic energy is really a slowly decreasing force.

A conclusion thus appearing at the first glance even contradictory to the presented results from which it is drawn, may bear a certain boldness of aspect, for which I hope to find that the observations preceding, as to the true character of all earthquake records, and of the sort and amount of stress that may be laid upon them, will be held a justification.

But while such uniformity or insensibly slow decadence may be the fact through time taken as a whole, there is also evidence of irregular and paroxysmal energy in reference to shorter periods; that is to say, not only (as all know) do earthquakes occur at some times, and not at others, in any given spot; but, taking the whole area of observation together (in which there is no moment, perhaps, or but a very brief one, wherein there is not an earthquake somewhere, or more than one), it will be found that there are epochs when they occur in greater numbers or intensity, either in the same or in several places within a limited time,—i.e. periods of paroxysmal energy.

If we omit from our view all the curves of earlier periods and less ample observation, and limit our consideration to those of the last three centuries and a half, i.e. from A.D. 1500 to 1850, this paroxysmal character becomes evident at a glance, and increasingly so in the last century and a half (the epoch of all human history the most replete with discovery), wherein the number of recorded observations is so great, that it was necessary for clearness to double the scale, of the ordinate of the diagram (Plate VI.) in relation to the preceding ones. On examining these curves, they seem to justify the following deductions:—

1. While the smallest or minimum paroxysmal interval may be a year or two, the average interval is from five to ten years of comparative repose.
2. The shorter intervals are in connexion with periods of fewer earthquakes—not *always* with those of least intensity, but usually so.
3. The alternations of paroxysm and of repose appear to follow *no absolute law deducible from these curves*.
4. Two marked periods of extreme paroxysm are observable in each century—one greater than the other—that of greatest number and intensity occurring about the middle of each century, the other towards the end of each.

This is one of the most remarkable facts that these curves seem to point to: from about the fiftieth to the sixtieth year of each century, both the number and intensity of earthquakes will be observed suddenly to shoot up; again, during the last quarter of the three complete centuries another but less powerful paroxysm is apparent. The paroxysmal power at these two epochs in each century far exceeds any other paroxysms within their limits.

Within the first period (in the 18th century) we find the great Lisbon earthquake; within the second, in the same century, the great Calabrian one. We find (referring to the Catalogue itself) earthquakes in great numbers, and many great ones—in the Mediterranean basin in the middle of the 17th century, and the great Jamaica earthquake in its latter decade; and in the 16th century, its middle period was marked by great earthquakes in China and in Europe, and the latter period by numerous shocks, and most of them severe, as at the Azores, &c. Whether the latter half of our century shall show the like, remains to be seen; from its commencement, however, it presents no paroxysmal period comparable to that between 1840 and 1850.

While this general resemblance of the curves of these latter centuries admits of no doubt, I would forbear from founding anything thereupon beyond this;—that within this time there seems to elapse a period of about a century between each of the *very greatest* paroxysms (number and intensity together) of earthquakes, and a like period between two other consecutive paroxysms, of which the second is the next greatest observable, although far below the first in power; that a period of thirty to forty years seems to occur between the first and very greatest paroxysm, and that next in power below it; and that in the middle period (especially in the 17th and 18th centuries) the number of earthquakes is greatest that crowd into a very brief time (four or five years), while at the latter period the number is thickly spread over ten or twelve years.

Upon the whole, the forms of the curves appear to indicate a comparatively sudden burst of seismic energy at each great paroxysm, and (by their flat tops or more sloping lines to the right hand) a more gradual subsidence, as if the train of causes required time to regain, after one spent paroxysm, their energy and regimen, which, when restored, were suddenly put into action, and which, once developed, were slow in being wholly expended and relapsing into repose.

The occurrence of such epochs at the middle, or towards the end of our purely arbitrary subdivision of duration into centuries, must be of course only accident. The interval of *duration between* one epoch and the next, is that alone which can have a cosmical basis.

We may then provisionally affirm the probability of two periods of earthquake maxima—a greater and a less alternately—as occurring in a hundred years, for the last three centuries of history at least. The existence of *some* periodic maxima in remoter centuries can hardly be doubted, although the epochs of the two maxima have a secular movement, and do not fall in the same place in the older times. Anterior to the 16th century, however, the general curves of time (Plates I. II. and III.) are, through paucity of observations, not sufficiently “prononcées” to enable this to be asserted from them, or to warrant the graphic representation of the epochs of occurrence of such paroxysmal periodic maxima for the whole even of the Christian era.

In Plate VII. fig. 2, the periods of paroxysm (number and intensity) are summed and grouped for each successive century of our era. The 1st, 5th, 9th, 12th, and 18th centuries are those of greatest seismic development, while the 1st and 2nd centuries A.C., and the 3rd, 7th, 10th, and 14th centuries of our era, are times of comparative repose. The numerical value of the paroxysmal centuries (as we may term them) increases, though not regularly, as the present time is neared, and is modified, without doubt, by the same conditions of observation that affect the expansions of the later curves of time. We dare not base any generalization upon it.

Numerically, we find the following average ratios of earthquakes for the

successive historic groups, of time extending over the whole record of the catalogue :—

TABLE XXIX.

Historic Group.	Ratio per Month.	Ratio per Year.
2000 to 1000 B.C. ....	0·00033	0·004
1001 B.C. to Christian era ...	0·0045	0·054
A.D. 1 to A.D. 1000 .....	0·0185	0·222
A.D. 1001 to A.D. 1850 .....	0·545	7·740
A.D. 1551 to A.D. 1850.....	1·450	17·370
A.D. 1701 to A.D. 1850.....	2·610	35·310

These numbers are absolute as well as proportional; nothing can more distinctly show the relation between the expanding areas of our curves of time and the increase of observation.

Sir Charles Lyell, at p. 428 ('Principles of Geology,' 7th edit.), calculates, upon approximate data, the average number of actual eruptions of volcanic matter at 2000 per century, or 20 per annum,—a result which harmonizes sufficiently with the preceding, and gives support to the commonly received view of the connected nature of volcanic and seismic phenomena.

This connexion receives further confirmation from the facts recorded by Perrey ('Mem. on Chili,' p. 201), as to the long duration there, of many earthquakes of a character much more violent and decisive than the tremors long continued, at Comrie, East Haddam, &c. He mentions earthquakes in 1647, 1730, 1751, 1819, 1822, and 1833, each of which lasted, with little intermission, for several months, and which, from other sources of information, seem to have been in some instances contemporaneous with prolonged activity of the neighbouring volcanic regions.

#### *Of Seismic Energy in relation to Season.*

I now proceed to such discussions as the data will admit, of the relations between seismic development and the time of year. In Plate VIII. are given the curves of mensual seismic energy obtained from the entire period of the catalogue, thirty-two centuries.

The northern and southern hemispheres of observations have been separated for the following reasons. The total number and value of the observations in each, present great disparity between them respectively. We are enabled graphically to present 5879 observational results for the northern, and but 223 for the southern hemispheres; and, for convenience, the vertical or seismic abscissa of the former is on a scale which bears to that of the latter the ratio of 100 : 1; the ordinate of time, which extends to the cycle of an entire year, and is divided and marked for the twelve months in order, is the same for both figures. As the months, in fact, involve or contain the seasons of the year, and indeed all other divisions of our solar revolution, and as the latter are unlike for opposite hemispheres, and are hereafter to be compared, such subdivision is necessary.

Examining figs. 1 and 2, Plate VIII., we find in the northern hemisphere the annual paroxysmal minimum in July; in the southern it appears to be in March. The duration of this minimum in the northern extends, with no very considerable fluctuation, over nearly two months, and suddenly rises

in July; in the southern the minimum is more suddenly arrived at, and a suddenly abandoned, and it extends over less than one month.

If we take May and June as one minimum in the northern, we have a second but very much lower one in September, and the corresponding second minimum for the southern hemisphere in August.

The annual paroxysmal maximum for the northern hemisphere is distinctly in January, and for the southern in November.

January and March are second maxima in the southern, as August and October are in the northern.

Whatever be the irregularities month by month however, the preponderance of seismic paroxysm for the whole twelve months lies amongst those that form the winter of our northern hemisphere.

In Plate IX. figs. 1 to 6, curves are drawn for mensual energy, for several corresponding periods for the northern and southern hemispheres. Figs. 1 and 2 indicate these for the whole period before, and for sixteen centuries after the commencement of our era. Here the northern minimum falls in July, and a second minimum in October, while the southern minimum falls in April, and the second before September, approximating thus to accordance with the curves of the whole catalogue, but less "prononcées." Then for later but shorter observed periods, figs. 3 and 4 give the mensual energy for A.D. 1700 to 1800, and figs. 5 and 6 for A.D. 1800 to 1850, being the half century in which, for convenience of comparison, the ordinate of time is double the scale of the other figures, the whole twelve months being represented by an ordinate of equal length in all.

In the eighteenth century, then, we find in the northern hemisphere the minima less distinct, occurring in July and September, and the maximum in January, with a second maximum between October and January; and in the southern hemisphere, the minima about March and September, and the maxima in May and December.

Again, in the first half of this nineteenth century we have (fig. 5) the northern minimum in June, a second but less marked minimum between November and December, and the maximum again in January and February; while in the southern hemisphere we have (fig. 6) the seismic minimum in March, and a second but much less marked one between July and August, and the maximum in November, with feeble indications of a second slight one in June.

Such are, then, the results of our monthly discussion. Comparing both hemispheres, they show several points of general agreement, and some of decided want of accordance. Little comparative weight can be ascribed to the few observations as yet made in the southern hemisphere, where so large a proportion of the earth's surface is covered by the ocean, and where so little of the land has, until a very late date, been the subject of observational record at all. It would seem warrantable therefore not to permit any such unaccordant phenomena between the two hemispheres to obscure the strong presumption which the facts otherwise support, that there really is a seismic paroxysm in the months forming the end and commencement of the civil year. It may not have a natural or cosmical basis, it *may possibly* be one of the accidents inseparable from an observational catalogue; but both this extended catalogue, and nearly all the partial catalogues of others, indicate it as a fact, and one not absolutely without some extraneous support in the present state of our knowledge.

When we group the consecutive months into four seasons, spring, summer, autumn, and winter, and reproduce the curve of seismic energy for the whole year, and separately for each hemisphere and for the whole period of the

catalogue, the same relation of scale as before (figs. 1 and 2, Plate VIII.) being maintained between the northern and southern abscissæ, we find some of the apparent anomalies disappear. In fig. 1, Plate X. the curve of season for the northern hemisphere assumes a very regular form, and gives a decisive minimum for the summer season (in May and June), and an equally clear maximum for the winter season (in December and January).

In fig. 2, Plate X. the corresponding curve for the southern hemisphere, however, still shows two maxima and two minima, the maximum at the commencement of winter, with second maximum at midsummer; the minima in spring and autumn assuming the months constituting the respective seasons reversed in the two hemispheres. It must be borne in view, however, that the base of induction for this hemisphere is from only 223 observations, against 5879 in the northern; that if the southern curve had been drawn to the same vertical scale as the northern, it would have appeared to the eye as almost a straight line; so that very little weight is to be attached to the discordance it appears to present to the corresponding curve, its necessarily exaggerated scale falsely addressing the eye.

In fig. 3, Plate X., the two curves preceding are combined, but to the same scale of vertical or of seismic abscissa; and the result shows how little in reality the data that we possess as yet for the southern hemisphere are capable of modifying the facts we have for the northern. The southern curve, in fact, scarcely alters to the eye the preceding northern one; and the new curve of season for both hemispheres presents still the winter maximum and summer minimum.

In fig. 5, Plate X., a curve has been obtained for the whole period of the catalogue and for both hemispheres, representing graphically all recorded earthquakes occurring near or at the equinoxes and solstices (the *critical epochs* of Perrey and others) within a limit of twenty days, *i. e.* ten days before and ten days after each equinox and solstice. The base of induction is moderately large, the catalogue containing the following numbers:—

Vernal equinox (March 10—30) . . . . .	310
Summer solstice (June 11—July 1) . . . . .	254
Autumnal equinox (Sept. 13—Oct. 3) . . . . .	249
Winter solstice (Dec. 11—31) . . . . .	318.

This we may call the equinoctial and solstitial curve of comparative seismic energy. It indicates a distinct maximum about the winter solstice, and an equally distinct minimum rather before the autumnal equinox. Taking the average of the whole year for any lengthened period, it may admit of much doubt, whether there is any real seismic paroxysm at the equinoxes and solstices, although a clear preponderance is shown by our catalogues at two out of the four annual epochs at which all are recorded; yet, from the accordance of Perrey's results with those given by this much larger base of induction, we cannot put aside the possibility that the fact may have a cosmical basis.

The most direct connexion in such case that we should expect to find, with other ascertained periodical phenomena, would be with the annual march of the barometer. In fig. 4, Plate X., the annual curves of mean mensual barometric pressure are laid down to the same scale of ordinate for time as the equinoctial and solstitial seismic curve below (fig. 5), giving the variation in atmospheric pressure for places in several and distant latitudes, Macao, Havanna, Calcutta, Benares; and in Europe, Halle, St. Petersburg, Berlin, Paris, and Strasburg,—the curves themselves having been reduced from those of MM. Buch, Dove, and Kaemtz.

On comparing these barometric curves with the seismic one, an obvious

similarity addresses the eye. Is there any real relation, however? In the First Report (1850), p. 68, &c., I have treated of the relations of atmospheric pressure with earthquakes, and at p. 78 have indicated a possible link of connexion of a *direct* character between them, and shown how it is conceivable that local increase of barometric pressure, and diminution simultaneously elsewhere, may conspire with other conditions to bring on volcanic action, and hence earthquake; and Perrey has hinted, in his memoir on France, p. 98 (4to), at some relation between his seismic mensural curves for Italy and Europe, having a minimum in November, and Dove's barometric curves, given in Pogg. Ann. for 1843, pp. 177, 201, which show something analogous (*quelque chose d'analogue*). Here we observe (comparing figs. 4 and 5) the barometric minima very closely correspond with the seismic minima, and *vice versa*. Bearing in mind the fact, that, as the sun gets nearer the zenith with the advance of spring and summer, the barometer falls, and that, taking the whole earth together, the atmospheric pressure is less over those portions of its surface where it is summer, and greater over those where it is winter; and that these differences of pressure are greater in general as the latitude is lower, so that simultaneously that hemispheric surface of the globe which is at the time most heated by the sun is also least pressed upon by the atmosphere, and *vice versa*; it seems warrantable to presume a cosmical and even a possibly direct connexion between the two phenomena; and this receives, again, some support\* from the fact (though not without large exceptions), that on the whole the great earthquake bands of the world pass through low latitudes, where these barometric and thermic fluctuations are most developed.

It would be worse than useless, however, to speculate minutely upon the physical relations of those facts, in the present imperfect state of our knowledge of their connexion.

The attempts which I have made to ascertain an absolute relation in number, from any discussion of the Catalogue, between the recurrence of seismic paroxysm at the equinoxes and solstices, and at an equal period of twenty days throughout the whole range of time, have been nugatory; it is impracticable to extricate a result, in which any confidence could be reposed, from the observational expansion and irregularities with the advance of time.

We must not be discouraged, however, that after the vast labour bestowed by so many, upon cataloguing earthquakes and discussing the results, we find these do not bring us even to the threshold of positive knowledge, and that the main reward of toil so far, is the having cleared away rubbish, and at length ascertained how far lists of facts, such as have been hitherto compiled from the best available materials, are of any further use. General Sabine, in his Introduction to vol. iii. of the 'Magnetical and Meteorological Observations made at Toronto,' p. vii., when narrating the former state of magnetical science as compared with its present position, says, "a few of the German observers had begun to note the disturbance of the horizontal force; but as yet no conclusions whatsoever as to their laws had been obtained:" in the words of the Report, "the disturbances apparently observe no law." Such may almost be said, as to our present knowledge of the distribution of earthquakes in time and in space, as referable to any natural law. We know how the position of terrestrial magnetism has become altered since the time referred to above by one of its best promoters; let us expect the same for seismology, and await with hope the rich flood of light that its

\* See also Mylne, British Earthquakes, Edin. Phil. Journ. vol. xxxi.



laws, when once reached, must shed upon terrestrial physics. The period of mere cataloguing (like that of fossil-list making in the earlier geology) seems now past; we must give it up, and, in the words of Herschel, "we must now grapple with the palpable phenomena, seeking means to reduce their features to measurement, the measures to laws, the laws to higher generalizations, and so, step by step, advance to causes and theories." (Address, Camb. 1845.)

Many cases are recorded in the Catalogue of Earthquakes, of shocks occurring at two very distant places upon the earth's surface, but felt simultaneously, or nearly so, at both. The coincidence in time is, for all *very distant* places, rendered extremely doubtful, from errors of observation and of clocks, and of their reduction for difference of longitude when the places are not on the same meridian.

Milne also has collected several such instances; for example—

February	1750...	England and Italy.
March	1750...	England and Italy.
May	1750...	England and Calabria.
August	1750...	England and European Turkey.
February	1756..	England and Central France, Holland and the Rhine.
November	1756...	Scotland and Malta.
January	1768...	Shetland and Central England.
December	1789...	Edinburgh and Florence.
February	1818...	Great Britain and Sicily.
September	1833...	England and Peru.
August	1834...	Scotland and Italy.
September	1834...	England and Peru.

In these, however, the coincidence in time cannot be assured within several hours; and it must be admitted, with Mylne, that the probability of anything more than mere coincidence is extremely slight.

In 1840–41 he found three shocks of this character: viz.

March	1840.....	Scotland and Germany.
June	1841.....	Terceira and St. Louis.
July	1841.....	Scotland and France.

(Edin. Phil. Journ. xxxi. to xxxvi.)

A few such instances, that possess a closer approximation in time and some additional probability of actual coincidence, have been extracted from the Catalogue, and have been drawn in the diagram (Plate X *bis*) to scale,—those which had horizontal components of motion in the meridians N. to S. or S. to N. being placed at the right and left sides of the great-circle section of the globe; and those with horizontal movement E. and W. or W. and E., placed above and below.

Right lines connecting the supposed distant points of coincident shock by chords of the circle, would *probably* pass through the origin or centre of disturbance common to both places on the surface. The origin might be deeper to any extent, and *possibly somewhat* nearer the surface, at least in the cases of the longer chords. Were any reliance to be placed upon these coincidences, some of them would thus give a depth of origin of about 800 miles below the surface. None of those, however, that appear to have any satisfactory evidence of a real connexion in time and in origin, suggest a depth for the latter of even one-tenth that amount. All our other know-

ledge, both of seismic and volcanic phenomena, leads to the conclusion of foci very much nearer the existing surface; and the diagram may be regarded as conclusive evidence that these presumed coincident earthquakes at very distant points, even if proved simultaneous, are unconnected, and have different origins.

In the most singular case on record, that of Ochotzk and Quito, places nearly antipodal, the common origin would actually be in, or not remote from, the earth's centre; and it is not conceivable that the shock, which, if sufficiently powerful, must in such cases be felt nearly simultaneously over the whole globe, should have been confined to the two extremities of a single diameter.

In recapitulation, it may be convenient to give in *numbers*, for occasional reference, a few of the salient results of the distribution in time, already graphically discussed:—

	No. of Earthquakes.	No. of Years.
Total number of recorded earthquakes up to A.D. . . . .	58	1700
Total number from A.D. to end of the ninth century . .	197	900
Total number from the beginning of the tenth to the end of the fifteenth century . . . . .	532	600
Total number from the beginning of the sixteenth to the end of the eighteenth century . . . . .	2804	300
Total number from beginning of nineteenth century to the end of the year 1850 . . . . .	3240	50
Total Catalogue . . . . .	6831	

The number of great earthquakes (*i.e.* those, as already defined, in which whole cities and towns have been reduced to rubbish, many lives lost, &c.) have been but imperfectly exhibited graphically, and not at all for the later centuries, from their too frequent recurrence making their notation difficult or confused; they are here given numerically.

Number of great earthquakes from third century B.C. to beginning of our epoch . . . . .	4
Number of same from A.D. to the end of the ninth century . . . . .	15
Number from beginning of the tenth century to the end of the fifteenth century . . . . .	44
Number from beginning of the sixteenth century to the end of the eighteenth century . . . . .	100
Number from beginning of the nineteenth century to 1850 . . . . .	53
Total . . . . .	216

If we double the last number but one, to embrace the entire 100 years, the correspondence between the results for the two last periods is remarkably close, viz. 100 and 106,—and although the series is still an expanding one, yet as the numbers for the 16th and 17th centuries are not large; it is probable that for the last 150 years at least, our news of all *great* earthquakes have been complete, and the cataloguing of *them* perfect, showing that at present we may calculate upon 1.37—say 1.4, or nearly  $1\frac{1}{2}$  recurrences of great and disastrous earthquakes every year, at some one or more places on the earth's surface, or one great earthquake disaster every *eight months*.

The total number of earthquakes, classed by months, is as follows :—

	Northern.	Southern.	Seasons, North.	Seasons, South.
January .....	627	19		
February .....	539	14		
March .....	503	9	1669	42
April .....	489	17		
May .....	438	20		
June .....	428	19	1355	56
July .....	415	18		
August .....	488	12		
September .....	463	17	1366	47
October .....	516	25		
November .....	473	32		
December .....	500	21	1489	78
Totals .....	5879	223	5879	223

Total of Catalogue for both hemispheres capable of mensual  
classification ..... 6102  
Total of unclassified, except as to annual date ..... 670

Total number catalogued..... 6772

of which, there are recorded by season only—

Spring ..... 6  
Summer ..... 7  
Autumn ..... 7  
Winter ..... 5

Total..... 25

January, February, and March have been taken for the spring of the Northern Hemisphere, and for the Southern, July, August, and September.

From the commencement of Catalogue to A.D. 1700, the recorded earthquakes in the northern hemisphere are to those in the southern, 940 : 21, or as 44·3 : 1. Again, from A.D. 1700 to 1800, the northern are to the southern, 1883 : 57, or 33 : 1; and from the year 1800 to 1850, or conclusion of the Catalogue, the northern are to the southern, 3076 : 145, or 21·2 : 1,—a further indication of the effect upon any such statistic record, of the march of human discovery, the last fifty years having brought into play the vast seismic regions of the Southern Ocean and South Pacific, before all but unknown. The observed earthquakes in the Southern Hemisphere may now be *estimated* at from 43 to 50 per century, or one every two years. (See Appendix, No. II.).

#### *Distribution in space.*

Such are, perhaps, all the legitimate conclusions that we can now come to on the distribution in historic time; and we now proceed to the discussion of the Catalogue, with respect to their distribution in space upon the surface of our earth. The method adopted, was that of graphically reproducing the area of each recorded earthquake by the superposition of coloured tints upon a large Mercator's map of the world. The map chosen for use was that arranged by J. Purdie, and published by Laurie, London, 1851,—the dimensions being 75 inches by 48 inches, which admitted, from its large

size, of perfect clearness and accuracy in the laying down the most complex localities, and those in which the shocks are most numerous. This has been reproduced to a much reduced scale (Plate XI.), to accompany the present Report; but although executed with much skill and care, by the lithographer and engraver, I find with regret that its small size has rendered a perfectly accurate transcript of the original impracticable, and that a very imperfect notion of the latter is conveyed by the reduced map.

Strictly, the limits of every earthquake are completely indeterminate; and were our globe perfectly solid, homogeneous, and elastic, no limits but its own could be assigned to any shock from whatever centre originating. The practical limit (so to speak) is, however, where the movement has become insensible without instrumental aid; for such have been all the observations dealt with in our Catalogue. This frequently embraces enormous surface-areas; but these seldom, perhaps nowhere, are symmetrically posited round the centres, or presumed centres, of disturbance.

We are not concerned here with any of the smaller or local circumstances that modify, in different radii traced from any seismic centre, the effects, and the directions and distances, to which they are sensibly transferred, but merely with some of the greater and constant conditions (for the same region) in which some of the great natural features of the earth's surface permanently modify or limit the transference and area of transfer of earthquake-waves transmitted from adjacent centres. Thus, along the whole chain of the South American Andes, the propagation of shock is greatly more towards the west than to the eastward,—the highest crests and intermediate valleys forming a rude sort of limit, beyond which, to the eastward and into the heart of the table-land of the continent, shocks felt with destructive effect down to the shores of the Pacific are propagated with greatly diminished force, or rather are so felt upon the surface.

Again, to take another large example, the Northern Indian earthquakes, whose origin is in Nepaul and along the central Himalayan axis, are propagated southwards and westwards into the great plain of India, far more than northwards into the enormous mass of table-land of Central Asia. We are at this moment not concerned with the causes of this, but simply with the fact, that in these examples, and in several analogous instances, it is a matter of observation that certain great natural features of the earth's surface and material, do modify the forms of the surface-areas shaken, and render them unsymmetrical, shortening the radii in one direction, lengthening them in another; so that the area, which in a more homogeneous mass would approach a circular or elliptic form, tends to an elongated, linear, or irregular outline.

In laying down, then, the forms and sensible area of shock of each earthquake catalogued (and often necessarily, from the imperfect data alone afforded), the following rules were adhered to:—

- 1°. When the form and sensible limits of the shaken area were ascertainable from the narratives, they were adopted.
- 2°. When these were wanting, as in the great mass of cases recorded, then, as respects form, the physical, geological, or other conditions of each area, known to modify the distant propagation of shock, were attended to.
- 3°. As respects sensible area, when this could not be ascertained for any one diameter of the shaken area, from the narratives, certain arbitrary conventional rules (founded upon a natural basis, however) were resorted to.

The method of colouring therefore was this. The whole of the recorded earthquakes of the Catalogue were subdivided preliminarily, with as careful a judgment as possible, into three great classes:—

- 1°. Great earthquakes, being those in which, over large areas, numerous cities, &c., were overthrown, multitudes of persons killed, rocky masses dislocated, and powerful "secondary effects" produced.
- 2°. Mean earthquakes, or those which, although perhaps having a wide superficial area, were recorded to have produced much less destructive effects upon cities, &c., and little or no changes upon natural objects, and scarcely any loss of life.
- 3°. Minor earthquakes, limited to those which, although sensible and producing in their full development some effects (fissures, &c.) upon buildings, did not affect natural objects at all, and left few or no traces of their occurrence after the shock.

Of the first class, the great Lisbon shock of 1755 may be taken as a familiar type. Of the second, examples are frequent over Central Europe and the Mediterranean basin, Southern Asiatic Russia, &c. And of the third class we find notices almost daily from every quarter.

As respects the very smallest development of this class, namely, the continuous tremors of Comrie, Pignerol, &c. &c., they were grouped into single shocks upon the same method as described previously for their discussion as to distribution in time.

To distinguish these three classes upon the map, three different intensities of water-colour tint were prepared—all from the same colour (red ochre and Indian yellow). The first and most intense having been decided to designate the first class, that for the second was obtained of one-third the intensity, by dilution with three volumes of water; and the third by dilution of the second with three volumes again,—the intensities of the three tints being therefore as the numbers 1,  $\frac{1}{3}$ , and  $\frac{1}{9}$ , or 9, 3, and 1. A single wash or application of the tint relative to its class, upon the given locality, designated each earthquake when laid down on the map; and the *form* or *boundary* of the tint, when not to be had historically, being ruled by physical considerations as already briefly described, the *extent* or *superficial area* of the tint (when not derivable from the narratives), was arbitrarily fixed by the following rule:—

- 4°. The extreme radius of great earthquakes (1st class) was assumed equal to 9°, or about 540 geographical miles; that of the 2nd class at 3°, or 180 geographical miles; and that of the 3rd at a single degree, or 60 geographical miles.

These were determined from the consideration that our records give, when viewed with a broad glance and apart from physical and local limiting conditions of a powerfully disturbing character; i.e. when the area of disturbance has had a sensible surface-boundary approaching to an irregular circle or ellipse,—a sensible diameter of about 1000 to 1200 miles for great earthquakes, and about 400 for those of our second class, those minor ones of the third seldom extending to above 100 or 150 miles in diameter.

In the case of the enormous surface-areas of the first class, however, it has rarely been necessary, in the later years of the catalogue period, to make use of this convention at all, the historic boundaries being usually attainable. These in many cases comprise areas of surprising extent: thus the great Nepal earthquake of 1833 extended sensibly over 7° lat. by

15° long., a surface four times that of Great Britain, and twice and a half that of France.

The Cutch earthquake of 1819 extended from E. to W. 5°, and from N. to S. 6°, though its dimensions in latitude are rather ill-defined. ('Asiat. Journ.' vol. xii. n. s.)

The Lisbon (1755) earthquake, and a few of those of the Malayan and Calabrian groups, and of South America, were sensible in certain surface-radii or great circles over 18°, or perhaps even 20°; but these are the extreme developments of our first class, and their limits historical, and therefore not affecting the preceding conventions. Some earthquakes recorded in the catalogue it was necessary to omit laying down upon the map at all, inasmuch as no sufficient data could be gathered to fix a probable local surface centre, nor any information as to the comparative energy of the movement. For example, some earthquakes (though but few) will be found catalogued as "in China," "in Libya," &c., with scarcely any particulars given. These omissions are not sufficiently numerous to affect the main result.

Besides these inseparable elements, volcanic and seismic phenomena, another intimately related phenomenon has been marked, as far as the data enable it. Those tracts of the earth's surface which have been presumed, with more or less probability, to be in slow process of subsidence to a lower level, are marked by blue tints, the boundaries of which are undefined to a great extent. These embrace the coral tracts of Darwin, the west coast of Greenland, and a small tract of the southern shores of the Baltic. All minor subsiding areas close to or in the midst of volcanic centres (such as the shore of Italy near Naples) are unnoticed, as such changes of level, due to the immediate action of adjacent volcanoes, are almost perpetual, and, in proportion to its state of activity, &c., common to every such area over the globe.

On examining the Mercator map (Plate XII.), then, upon which, subject to the above rules, the whole Catalogue has been graphically represented by tinting, it is to be remarked that—

1. The whole of the earth's surface known to be subject to earthquakes will be found tinted more or less intensely.
2. The most deeply tinted surfaces mark the places where either the number, or the intensity, or both, of successive earthquakes are the greatest.
3. Whether at any one point the depth of tint be due to number or to intensity, and the relation between these, may be found by reference to the Catalogue itself.
4. The shading-off or evanescence of tint towards the extreme sensible limits of the seismic (coloured) regions over the whole map is due (not to shading or evanescence of colour in the artist's sense, but) to the *superposition of tints only* upon the principles already explained. Hence it follows (admitting the two conventions made, as to intensity and area, and the partial extent to which these influence the results historically gotten), that the tinting upon this seismographic map does as truly represent, over our earth, the known seismic regions in form and extent, and the relative intensities and successive developments of seismic action therein, as the contour lines of a contoured map represent the forms of irregular surfaces, and the rate of inclination of the slopes and valleys by their approximation or separation; or as truly as (upon certain engraved maps, *e.g.* Irish Railway Commission of Ireland and some German ones) the relative heights and rapidity of rise of mountain chains are

graphically represented by multiplying the engraved lines that produce the shades (or tints) in the joint ratio of the heights and rates of slope, i.e. as the sines of the angles upon a given base.

I therefore venture to present this map as more than a mere picture—as being, in fact, a first approximation to a true representation of the distribution of earthquake forces, so far as they are yet known, over the surface of our world.

The volcanoes (including fumaroles and solfataras) are shown by black dots, and all that are known to be in activity, or are recorded to have been so, or from other evidence may be presumed to have been so, within the historic or late geologic periods, have been represented, from the authorities of Johnston, Berghaus, V. Hoff, Daubeny and others.

The exactitude of the number of volcanic vents along the great lines of foci, is, however, less important to our object than the marking in of isolated volcanoes.

Let us now examine our map in detail, and see what it can teach us, taking for the starting-point of our seismic survey the meridian of Greenwich, the central point nearly of the dry land, and passing eastward in our review. But first let us notice some points in the physical features of the earth's surface. Of the 111,000,000 of square miles of ocean (in round numbers) covering three-fourths of the surface of our globe, the greater part is to us a blank, so far as direct observation is concerned, the exceptions being the Atlantic with a part of the Southern Ocean from about  $10^{\circ}$  S., northwards, and of the Northern Ocean up to nearly  $70^{\circ}$  N.,—nearly all other marine seismic observations being in connexion with centres upon adjacent land.

We see these enormous pelagic areas, consisting of irregular, saucer-shaped, shallow depressions, bounded by flowing coast-lines which, by the connecting points of oceanic banks and islets, we can generally unite into closed curves, forming thus distinct but inosculating basins—of which the Northern and Southern Pacific together form the largest example. Those vast but comparatively very shallow depressions may, when viewed in individual detail, be subdivided into smaller shallow concavities by banks and shallows below the ocean surface. But each great oceanic saucer, bounded by the existing continents and their fragmentary outliers, presents an almost continuous fringe around, of mountain-chains and volcanic foci. Thus, starting from Mount Elias, long.  $141^{\circ}$  W., lat.  $60^{\circ}$ , at the northern extremity of the Pacific, we find a scattered chain of volcanoes along the west coast of North America, with a continuous bounding coast line of mountains. South of the gulf of California, the Mexican and Central American volcanoes, with those of the South American Andes, carry on a closely linked chain, almost to its southern extremity. Here the volcanoes of Tierra del Fuego trace the line on towards that of Graham's Land, where it plunges into the unknown regions of the Antarctic continent.

Returning to the extreme north again, from Mount Elias, we have the almost unbroken line of mountain and volcano of the Aleutian Archipelago; carried down through the great elevated peninsula of Kamtschatka, the Kurile Isles, Jesso, Japan, the Philippines; and to the north of New Guinea by its volcanoes and those of New Britain, the Solomon Isles, Egmont, New Hebrides, New Caledonia, and New Zealand, to the Antarctic ice again at the Balleny Islands and Buckle Volcano—a connected belt, with the exception of the unknown Antarctic region, round its vast pelagic circuit. Within this the subordinate or secondary basins are marked, though less distinctly, by lines of volcanic foci: thus from Japan to New Ireland through the Ladrone Islands, a distinct though sparse line of volcanoes cuts off the basin

(nearly one-half the area of Africa) bounded on the north by Japan, and on the west by the Philippines.

From lat.  $30^{\circ}$  S., a sub-oceanic crest-line of shallows appears to spur off eastward from the volcanic foci of New Caledonia and New Zealand, and, trending westward and a little northward through the Tonga, Society, Marquesas, and Gallapagos Islands, connected by continuous banks, joins the Central American group of volcanoes, thus cutting the great ocean basin nearly into two secondaries, each of which is probably in a less marked manner subdivided,—the northern sub-basin, by a line through Christmas and the Sandwich Islands, to some point of the volcanic group of the Audreanofsky Islands in the Atlantic Archipelago, making in its course a wide sweep to the east and north through an almost continuous chain of isles and banks; and the southern sub-basin by a line from the Society Islands through Easter Isle and Juan Fernandez, and combining with the great Chilean volcanic chain at its eastern extreme.

A vast fissure (noticed by Humboldt), and marked by an almost continuous line of volcanic vents, extends in a direction nearly east and west, right across Mexico, between lat. N.  $18^{\circ}$  and  $19^{\circ}$ . It is nearly 500 miles in length. Its main direction, if produced, bears upon the volcanic island of Revillagigedo, and, as Humboldt also thinks, probably extends to Mouna Roa, in the Sandwich Islands. The Mexican extremity of this enormous crevasse probably marks the continental end of one of the great dividing ridges of the sub-basins of the Pacific.

Within the great Pacific Basin will be found (tinted blue) most of those great areas of probable subsidence indicated by Darwin\*. These bands will be observed occupying the great sub-basins of the ocean, not very distant from great volcanic lines, and although not (with our present imperfect knowledge of soundings) quite free from the suspicion of occasionally intersecting such lines (*e. g.* Marquesas and Society Islands, Ladrone, and New Guinea), yet, on the whole, keeping surface positions intermediate to the volcanic cinctures adjoining or around them.

Less distinctly we may trace the cincture of mountain- and volcanic chain around the shallower Atlantic basin, and, through it, upon the submarine elevations dividing its sub-basins. Thus, starting from Iceland; the Ferro Isles, Scotland, and the mountains of Wales and England (with the breach of the English Channel, a narrow line in relation to the scale of our present survey), the Rhenish-German chains, the French and Western Alps, the Pyrenees, to Cape Finisterre and the coast of Portugal, connect by the Azores, and by innumerable submarine rocks and shoals, across to Newfoundland. Here the lines to the northward may be pronounced unknown, until, returning back to Iceland, we find it approximates to the point we left through the great igneous and abrupt coast-line of Greenland.

In connexion with this oceanic basin, we have two probably subsiding tracts of land—the one in Davis's Straits, the other in the Baltic—both tinted blue.

The Central Atlantic forms a well-marked basin girded with volcanoes and mountain-ranges. Leaving the last stated boundary-line at Newfoundland, and going again eastward to the Azores, thence through Madeira to the Canary Isles, the Cape de Verds and including the great sub-oceanic volcanic region between  $15^{\circ}$  and  $30^{\circ}$  long. W., and lat.  $3^{\circ}$  N. to  $10^{\circ}$  S., going westward by the island of Fernando Noronha to Cape St. Roque on the extreme east of the South American continent, returning to Newfoundland,

\* See Dana on Areas of Subsidence in the Pacific. Ass. Amer. Geol., Albany, 1843, and Edin. Phil. Journ. (New), vol. 35. p. 341.



we trace the line southwards through the several chains of the United States down into Georgia, where, with the comparatively narrow breach of Lower Florida, it is carried on by Cuba and the whole chain of volcanic islands of the West Indies to Trinidad and the South American continent again. The Gulf of Mexico and Caribbean Sea form a smaller but separate basin. In the southern Atlantic we can trace a dividing ridge through South Ascension—the great suboceanic tract just referred to—North Ascension, St. Helena, and probably to Cape Negro on the African west coast, and thence to the Cape of Good Hope, and returning westward by Tristan d'Acunha, thence S.W. to the Isle of Georgia (lat.  $55^{\circ}$  S.) and through the Falkland Islands to the volcanoes of the southern point of South America; but this, like the sub-basins, through the scattered indications which alone we yet have in the vast southern portion of the Eastern or Indian Ocean west of Australia, is uncertain.

There is little doubt that Australia, on its northern existing coast-line, was once united with New Guinea and the Aru Islands west and south of it (Wallace, *Silliman's Journal*, vol. xxv.), and possibly with much of the land outlying to the west of that vast and now isolated continent; if not, the intermediate seas would be much deeper than they are, and the west coast of Australia with its mountainous chains would bound an ocean basin whose western boundary would be marked by a line of volcanoes from New Guinea to New Zealand and the Southern Sea.

The seas of Ochotsk, of Kamtschatka, of Japan, and, above all, the Chinese and Malayan Seas with Borneo in the midst, form so many distinct basins, small relatively to the vast areas we have been reviewing, but distinct and strongly marked. In the Chinese Sea we have a probable tract of subsiding land, tinted blue upon the evidence of Darwin. The bay of Bengal, well-marked all round northward from Sunda, and belted with volcanoes to the Ganges, and with mountains near the coast thence to Ceylon, joins probably Western Australia by a suboceanic ridge, indicated through the rocks of Greville and Compton, the Island of Apaluria with the adjacent submarine volcano of 1789, and the ocean shallows and soundings, about  $100^{\circ}$  W. long. and  $20^{\circ}$  to  $25^{\circ}$  S. lat.

The separate basin of the Arabian Sea is equally distinct, from Cape Comorin along the Malabar coast, all highly mountainous, Beloochistan to the mouth of the Persian Gulf (itself a small basin), thence by the Arabian coast-line to the volcanic region at the mouth of the Red Sea, and into Abyssinia with its characteristic and enormous crater-form lake of Tzana (though as yet not possessing any earthquake record), and thence through regions scarcely known upon the East African coast, crossing to the Comoro Islands (volcanic) and to the mountainous regions of Madagascar,—the volcanic islands of Bourbon, Mauritius and Rodriguez, the Nazareth and Saya banks, the Chagos Archipelago and the Maldives and Laccadive Islands, completing the cincture with the Malabar coast again.

Along the great band of these islands, and thence trending westwards by the Saya bank, lies one of the great tracts of ocean-floor which Darwin has shown to be probably subsiding (tinted blue). Assuming that this really is a band of subsidence, it would be more probable that the volcanic girdle takes a wider sweep to the south and west of this band, and, leaving the Island of Rodriguez, makes for the volcanic centre marked in the ocean at long.  $90^{\circ}$  E., lat.  $10^{\circ}$  S., and thence turns northward to join Ceylon, Cape Comorin and the volcanic region of Pondicherry.

Leaving the great ocean and great continent, we trace smaller basins (or rather saucers, for their extreme shallowness in relation to their surface-area must never be lost sight of), where larger portions of the elevated moun-

tain-cincture, studded here and there with volcanic vents, are found submerged and inland (*i. e.* where the basin within its boundary is partly land and partly water), thus: Ætna, Lipari, and Vesuvius, the Apennine chain, the southern and western Alps, the Pyrenees, and the great tableland and axial chains of the Spanish peninsula, with the mountains of Northern Africa, on through Pantellaria and Sicily, form one such basin. Closely connected with this is the adjoining basin of the Ægean with the volcanic Greek Islands: the Black Sea, with the volcanic regions of Armenia and the Caucasus, form a distinct basin extending on the north far into Russia; the Caspian, with the Sea of Aral and the plain of Tartary embracing Persia, another, having its own volcanoes near the former sea, while Central Asia, so little known, seems probably divisible into several vast saucer-like areas, north of the great tableland, of which the great lakes and the Altaï chains, with their imperfectly described volcanoes, probably mark some parts of the cinctures, but which, in the absence of knowledge as to relative level, it would be premature to attempt to trace. Many of these basins further on to the north appear no longer bounded by closed curves upon land, but to open out along the great river-courses which run northward and become lost to our knowledge in the icy solitudes of northern Asiatic Russia.

Northern Europe presents us with the great Scandinavian, German, and Russian saucer, whose features have been made so clear to us by the labours of Murchison and others; while, further north and west, a distinct oceanic basin appears in the Northern Sea, of which the Norwegian chain, Shetland, the Ferro Islands, Iceland, the west coast of Greenland, and the volcanic islands of Jan Mayen, are the marked boundaries.

North America, so far as its surface has been ascertained, is divisible into several well-marked shallow basins, the most obvious being those of the Mississippi; of the Arctic Highlands; the two deserts east and west of the Rocky Mountains (lat.  $30^{\circ}$  to  $40^{\circ}$  N.); and of the great lakes, to which may be added hereafter Labrador and the North of Canada with Hudson's Bay; the eastern talus of the great Atlantic slope falling into the boundary of the Atlantic basin. Enough, however, has probably been stated to indicate that, viewed upon the broadest scale, the surface of our globe consists, as respects its present solid surface, of a number of saucer-like depressions, when large, having also *convex* central areas, all having plan outlines approximating to extremely irregular ovals or other closed curves, and bounded by mountain-chains or mere rounded or flat-topped ridges or elevations of the solid sphere, greater or less. Where three or more of these inosculate, the point between the junction is most frequently a group of mountains or a high tableland, or both,—as, for example, the knots (Cusco and others) of the South American Andes, upon which the suboceanic ridges abut. The greatest of these saucer-like concavities either form or subdivide the beds of the ocean, but other such shallow basins can be traced upon the existing land, and embracing seas or parts of seas, or great lakes, or river-courses within them, but still enclosed by girdling chains of mountains or the precipitous flanks of tablelands, which latter in their full development are the pedestals of the greatest mountain-chains. Amongst the wide-sweeping curves that indicate the dividing crests (if we may use such a word to designate elevations often, *especially in the subdividing ridges of the oceanic sub basins*, so very low in relation to the areas they separate) of these vast oceanic basins, it appears impossible to trace any approach to parallelism, or, indeed, that such an arrangement could exist.

We do, however, remark, that it is along these girdling ridges, whether mountain-ranges or mere continuous swelling elevations of the solid, which divide these basins beneath the ocean surface one from the other, that all

the volcanoes known to exist upon the earth's surface are found, dotted along these ridges or crests in an unequal and uncertain manner.

And as our oceans and greater seas are bounded, and below their water-surface subdivided, by these ridges, along the lines of which the volcanic foci are found; so, as long observed, it is a fact that all active volcanoes are comparatively close to the sea, or to some large body of water; indeed, they could not present the phenomena they are known to do, without a supply of water, and nearly always of sea-water, more or less constant and plentiful, derived from this propinquity. (See Trans. R. I. Acad. vol. xxi. pp. 98, 99.)

However different, then, may have been the train of forces upon which the elevation of the mountain-chains and other relatively raised lines of the present surface have depended, from those which now produce the ejections thrown up by volcanic action, the latter seem to follow upon the traces of the former; and we shall find that the earthquake generally does so likewise. The distinction long made, into linear and circularly grouped or clustering volcanoes, I conceive has no foundation in nature. By far the largest proportion of all the volcanic vents over the whole earth are found arranged along the flowing lines of mountain-chains.

The so-called clusters or *circular* groups never are found covering surface-areas larger, if so large, or more widely apart, in any single group, than those within which volcanic vents are found that undoubtedly belong to linear arrangements (Mexico for example).

Nearly all the clusters or circular groups of volcanoes are situated in the ocean, and far from continental land; they stand on, and are connected with each other, by oceanic plateaux, rounded submarine ridges, shallows, rocks, and islands, and by similar connexions with points of continental coasts, either mountainous or volcanic. The conclusion seems justifiable, that these clusters or groups are the only visible points, "few and far-between," situated along sub-oceanic linear volcanic ranges, along which the open vents are probably much fewer than along equal lengths on land, but still marking as truly as the most thick-set linear vents the great lines of fracture of the earth's crust. Were this the proper place, much might be adduced in support of this view of volcanic distribution.

The connexion between volcanic and seismic effort is so obvious, although the nature of their connexion has been so little understood, that we are prepared to find the deepest tints of the seismic map fringing off from those great mountain-ranges where the volcanic foci stand close in rank; but it was not before so apparent that, along the elevated ridges or mountain-ranges that gird and divide the great surface-basins, even when not volcanic, or when volcanic foci are rare and widely separated, the earthquake is still found to range in broad bands, following the general line of the crest.

Upon a very much minuter scale of survey than we are now occupied with, such would seem dependent upon the physical fact, that the earth-wave will be best and furthest propagated through the most solid and elastic line of material, that is, in the axial line of mountain-chains and valleys, as is found to be the case; but the indication of our map is a far more extensive one, and points to some different and deeper cause. Thus, to resume our seismic survey of the Map, Iceland, Ferro, Shetland, and the south-west coast of Norway, nearly to Christiania, form a broad band of seismic connexion, which would probably run on to Greenland, and along its coast to Jan Mayen, did we know anything of their earthquake history.

The fact (if it be so), that the west coast of Greenland, in Davis's Straits, is sinking gradually, would in nowise conflict with the probability of 1858.

seismic action, or even elevation of the opposite eastern coast, which, it is extremely probable, may be slowly rising, just as the Scandinavian peninsula is doing; and it does not seem a disproportioned supposition, that all three changing levels are due to the prodigious scale of volcanic action going on at Iceland.

The Swedish system is another band stretching north-west from the great lakes to Kola Bay in Russian Lapland; and future observation may probably include in it the parallel chain of the Doffrefels Mountains. To the south we mark the broad band whose extremities are Portugal and the Azores, always in seismic sympathy with each other, and with which the band of the Canaries is in relation through Madeira, and is also more distinctly connected with the earthquakes of Barbary and Morocco.

From Tunis, a narrow but intensely marked seismic band stretches up through Sicily and Italy, sends off a spur to the west through the Alps of Piedmont and Southern France, along the whole line of the Pyrenees, and to the northern coast of Spain; and widening out over the central Alps, so as to cover a large area of central Southern Europe: extending east and west from Lyons to Vienna, it again contracts in width at about the latitude of Strasburg, and stretches away northwards over the whole Rhenish mountain system, and becomes nearly evanescent upon the low plains of Holland and the coasts of the North Sea, where, though infrequent, earthquakes are not unknown.

Over the great plain of Central Europe, and far into Southern Russia to the north of the Euxine, the want of observations with distinct dimensions renders any attempt at precise boundary nugatory. Were our records better, the Carpathians would no doubt stand out in stronger tint than the well-inhabited country of Poland and the Vistula, where the greater frequency of seismic records deepen the tint from Cracow up towards Riga. Better observations would no doubt also mark with a deeper tint a band of connexion along the Balkans and line of the Danube, between the Austrian Alps, so frequently shaken, and the Bosphorus, where the neighbourhood of Constantinople shows itself abnormally intense, from the reiterated records of earthquakes there that have been collected century after century at that ancient seat of splendour and civilization. Thus it is that the disturbing causes that we have remarked as affecting the Catalogue follow into its discussion in space as well as we have seen they do into that of time.

A broad but somewhat ill-defined seismic band stretches from the Greek Archipelago to Constantinople, spreads over a large portion of Asia Minor, and is carried through Palestine, on to the valley of the Lower Nile and the coasts of the Red Sea, extending further south along its Arabian shore. From the Gulf of Scanderoon, by Aleppo and Mosul to Lake Van, and the south of Ararat to Shirvan and Baku upon the Caspian, a wide band of great and long-continued energy extends, which probably joins into the Caucasus and is connected with the seismic system of the Ourals in the distant north.

Again, from about the parallel of Bagdad, a broad but ill-defined seismic band stretches nearly due east through the whole of Persia, Khorassan, and to the Hindoo Koosh, sending off a narrower band along the shores of the Persian Gulf. About Cabool the Persian band joins into the vast seismic area of Northern India—a band, whose northern boundary is the Himalayan chain, and which stretches nearly parallel to it from Cabool to Calcutta and to the Gulf of Cutch. Beloochistan appears exempt, but probably only because hitherto without observation or record. Leaving the vast and *strongly* agitated seismic system of Central Asia, of the boundaries of which

so little is yet known beyond the general fact that northwards the seismic bands appear to follow the great river-courses, or more probably the great axes bounding *them*,—and passing also the so frequently convulsed Chinese empire, which appears to have two chief seismic centres about Peking and Canton (these cities have been the *centres of observation* for all, or nearly all, the Chinese records of earthquakes that we possess, and hence one reason of the depth of seismic tint around them ; but it is also to be observed that two of the great volcanic districts of the “ Fire Hills and Fire Wells ” of China are situated within the tinted or shaken regions adjacent to the two capitals), with a third more central volcanic region, of which I am not aware that anything is known seismically,—and remarking the apparent exemption of Cochin China, for which there are no records,—we at length arrive at the greatest and most formidable earthquake- and volcanic region upon our globe. Stretching in a vast horse-shoe, convex to the south, from Burmah and Pegu, and surrounding the great island of Borneo, with an intervening belt of sea, and reaching round to Formosa on the north-west, we have an almost continuous girdle of volcanoes and lofty mountains. Every island of the group, including Java and Sumatra, Celebes and Mindanao, is shaken with earthquakes the most formidable and frequent ; and we can point to no spots upon the whole earth’s surface upon which seismic energy is exhibited with an intensity equal to that of Luzon and Sumbava.

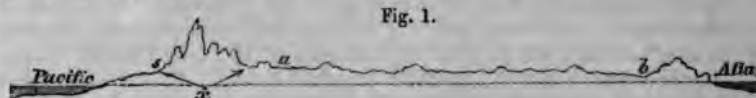
Nothing even in South America or Mexico appears to rival the grandeur of volcanic energy and resultant seismic action here. In 1815 the thunderings of Tomboro, in Sumbava, were heard nearly 1000 miles away (through the earth no doubt). The ashes, or, more correctly, the finely-divided tufadust, floating in the air, made mid-day into darkness 300 miles away in Java, and were precipitated at sea even a thousand miles from the point of ejection, while whole tracts of country, with inhabited towns, have suddenly become engulfed and disappeared during periods of eruption, which over a large portion of the chain, from one extreme to the other, are almost continuous.

It will be remarked that the seismic tint is both more intense and relatively *more circumscribed in area* along the bands that surround the linear volcanic vents, where they cluster thick, than along mountain-chains or ridges that possess few or no volcanic vents. This no doubt arises from the centres of impulse in active volcanic lines being situated at a comparatively small depth, in fact, coming from the actual bases of the crater, or not far beneath ; and hence the horizontal propagation is not so great for a given force of impulse as where its centre is situated deeper, and the explosive effort rendered abortive to rupture the solid crust above. The intensity of tint in the former case is due to *repetition* of effort, as well as to occasional intensity of impulse.

An earthquake in a non-volcanic region may, in fact, be viewed as an uncompleted effort to establish a volcano. The forces of explosion and impulse are the same in both ; they differ only in degree of energy, or in the varying sorts and degrees of resistance opposed to them. There is more than a mere vaguely admitted connexion between them, as heretofore commonly acknowledged—one so vague, that the earthquake has been often stated to be the *cause* of the *volcano* (Johnston, ‘ Phys. Atlas,’ Geology, p. 21), and more commonly the volcano the cause of the earthquake, neither view being the expression of the truth of nature. They are not in the relation to each other of cause and effect, but are both unequal manifestations of a common force under different conditions.

Further north we have the somewhat less terrible, but yet deeply-

coloured seismic bands of Japan, the Kuriles, and Kamtschatka; and, passing to the opposite shore of the Pacific, we are presented with the deep coloured seismic bands of Mexico and the South American Andes, whose influence reaches far out into the ocean, but eastward or landward checked by the great chain. The reason of this fact, which has been but alluded to, is not hard to find. The general *section* of the South American continent, from west to east, consists of a comparatively low-lying narrow littoral border-country on the Pacific; then the immense chain of Andes rising in successive ranges to the axial peaks, and beyond these a vast plateau—the elevated land of the great continent—reaching over near the western coast, where some lower ranges of mountains terminate near the Atlantic shore and bound its basin. This is rudely shown in the accompanying figure (1).



Now if a shock be transmitted from any origin within the great chain and below the level of the great tableland, *ab*, as from a point *x*, a transmitted elastic wave in the direction *xs*, reaching the surface after a very short transit, will, in accordance with the well-known law of elastic bodies, have its amplitude increased (just as the last billiard-ball of a row of touching balls, is that which is projected when the first of the line is struck by the blow of a propelled ball), and more powerfully shake all surface objects at *s* than others situated at *a*, although at an equal radial distance from the centre of effort,—the free movement of the elastic wave being here reacted upon by the elastic mass of the tableland which blocks its progress until compressed. Objects on the tableland, at an equal distance from the origin, may (dependent upon its depth) receive the shock (even of only equal amplitude) at such an angle of emergence as will give a power of overthrow to the horizontal component of the wave's transit. There will in every case be a reflected wave back from the mass of the tableland—an *earthquake echo*—producing at *s*, or along the littoral border, a second shock, with a line of direction nearly the same, but with a direction of motion reverse to the first, one shock only being felt on the tableland.

To return, the seismic band of the Andes, at the extreme north of the continent, and at Trinidad, inosculates with that of the West India Islands which sweeps round the Caribbean Sea, and appears, so far as records go, to transmit its movements further into the Atlantic, than into the former sea; if so, that probably arises from causes quite analogous to those already explained for South America—a shallower sea-bottom to the westward of the Caribbean Sea, thus playing the part towards the deeper bottom of the Atlantic that the tableland plays towards the littoral slope of South America. The North American records have been too few and ill-defined as to bounce to produce as yet any very distinct conclusions from the tints, which prove, however, that its western and southern seaboard are by no means free from earthquake. This has in great part arisen from the great want of orographic delineation on nearly all (even the largest and best) maps of the United States which omit all heights and natural features. The Californian system, the Rocky Mountains, that of Upper Missouri, of the Mississippi, and the northern lakes and basin of the St. Lawrence, form the chief and separate regions in which earthquakes have been so far observed most frequently.

Future observation will probably show a connexion between the great sub-oceanic seismic tract of the South Atlantic and the South American continent on its western sea-board, between Cape Roque and La Plata. It does not appear so far to have any connexion with the opposite African coast between Cape Palmas and the Bight of Biafra. A better knowledge will also probably widely extend the seismic boundary of the Cape of Good Hope along both the east and west shores of Africa to the northward, and bring within it the great island of Madagascar, as to which nothing is so far known. New Zealand (unhappily for its future progress) will afford one of the best regions in the world for the study of volcanic and seismic phenomena in their connexion.

The earthquake-band of Western Australia, at present so small in proportion to its vast surface, will probably be found to reach much further towards the interior, and embrace Van Diemen's Land and a considerable stretch of the southern coast to the eastward. It remains yet to be observed whether even the small surface explored of the east side of the Great Island is subject to earthquakes or not. Abyssinia too, though not affording the record of a single earthquake, is too closely united with the seismic region of Arabia and the mouth of the Red Sea, to be probably perpetually in repose.

There are great *untinted spaces* upon our map. The northern and southern polar regions, immense tracts in North America and in Northern and East Central Asia; surfaces in South America nearly as large as all Central Europe; the whole African continent except the northern edge and southern point; nearly the whole of Australia, and almost the whole of the bed of the great ocean, are perfectly unstudied and unknown to us, as respects their seismic condition. They appear white, and hence free from earthquake, upon the map, but only because there are no observations.

Future researches will probably, however, show that all these vast tracts of land are traversed by earthquake-bands presenting generally the features that we recognize elsewhere, and that the ocean-bed, far from the continents, although always much less disturbed, for equal extent of surface, than the land, and especially than the coast, of the great oceans, is also traversed by earthquake-bands continuous with and tracing out their shallowest contours.

Had navigation been, in times past, as frequent and constant in the Pacific and Southern Indian oceans as it has been in the narrower Atlantic, especially north of the equator, the former would most probably present, over very much of their vast surfaces, light seismic tints such as almost the whole Atlantic presents, included as it is within the range of movements transmitted from both its western and eastern borders, and also from the foci within its bosom, connected by seismic lines so closely adjacent, *i. e.* with sub-basins so comparatively small in area.

Imperfect as are our observations on land, they are much more so upon the surface of the great ocean that covers three-fourths of our globe; so that only a very rude approximation, and from very partial data, can be made towards the solution of the question, What is the relation of seismic energy beneath the land and the ocean?

The result of Perrey's memoir 'On the Basin of the Atlantic,' (Dijon Mém.) assigns, for a period from 1430 to 1847, or 417 years, a total of only about 140 shocks (or three shocks per annum) observed over an area of about 24 millions of square miles. If we contrast this with the only tolerably well-observed portion of the dry land, the great European area, we find thereon at the least 40 shocks per annum observed upon an area of 1,720,000 square miles, or (allowing for regions included, but never observed), say, 1,500,000 square miles. There occurs therefore annually in the Atlantic

basin one shock for every 8,000,000 square miles of surface, and, in the European area, one shock for every 37,500 square miles of surface; so that within these large areas the seismic energy beneath the land is to that beneath the ocean-floor as 213 : 1 nearly. The annual number of observed European earthquakes is certainly below the actual number that occur; and although the Atlantic is the only oceanic surface of our globe over which there can be a pretence even to correct observation, yet its recorded numbers must be very far indeed below the truth, and immeasurably lower in proportion than for Europe. Making, however, every allowance for imperfect information in the pelagic area, the disparity of relative numbers is such, as to warrant our estimating, with some confidence, that the seismic energy is manifested with much greater power for equal areas upon the dry land than upon the ocean-bed.

Should it ultimately prove a fact, as rendered probable from the beautiful investigations of Darwin, that there are great areas of gradual subsidence now in motion beneath the Pacific, it may still happen (though it is not probable) that seismic or even volcanic bands may traverse such areas of subsidence, without materially affecting their general downward movement. Although many portions of the earth's surface now show evidences of vertical instability, either slowly, or *per saltum* occasionally, rising or sinking, these effects are all comparatively insignificant in extent. The great formative forces, whatever they were, upon which the elevated land of the great continents and the depression of the ocean-beds depended, have ceased sensibly to act. The function of the volcano and the earthquake in the existing cosmos is not creative, but simply preservative; and vast as they appear to eye and sense, their effects are very small in relation to the totality of the great terrestrial machine.

If, however, such large areas of oceanic subsidence as have been supposed really exist, they will most probably be found situated almost centrally within the oceanic sub-basins, and hence surrounded but not traversed by seismic bands.

There is one fact, which is shown by the relative positions, upon this map, of the greatest volcanic areas upon our globe (and these the most active) and of the blue-tinted areas of probable subsidence, that is worthy of fixing our attention.

It will be observed that the blue bands of probable subsidence are tolerably adjacent to the greatest seats of volcanic activity, and that the latter generally have subsiding areas at more than one side. Thus, in the Pacific, the blue band is along the great volcanic girdle from Celebes to New Zealand, and thence stretches between (and at one point *may* cut through) the line of suboceanic volcanic girdles, from the New Hebrides to the Marquesas.

Again, the great volcanic horse-shoe girdle of Sumbava is between the blue (subsiding) area in the China Sea north of Borneo, and the blue coral bands north of Australia, which whole continent, or at least its western and northern parts, may probably be subsiding also. Lastly, in the north we have Iceland and its volcanic system, between the sinking coasts of Greenland and those of the Baltic.

If we admit, then, as certain, that these vast tracts are subsiding, we can scarcely withhold our belief that the subsidences are due to and are the equivalent in bulk of the solid ejecta and exhalations of these various great volcanic areas respectively.

The assumed area and extent of subsidence of those supposed subsiding tracts are, however, I apprehend, greatly overrated; this, however, is not the place to pursue their consideration.

From all that has preceded (here and in former Reports), it is plain that



nothing like one or more great general horizontal directions of seismic movement can exist upon any very large tracts of the earth's surface; and that if it be even possible to assign, as proposed by M. Perrey, a general horizontal component for limited areas, the method does not admit of extension. The normal type of an elastic wave in a homogeneous solid, is only varied, so far as observation yet goes, by the accidents principally of material and surface, whether the area of disturbance be great or small.

Nor does the seismic intensity in any part of the world, so far as originating impulse is concerned, seem connected with the superficial character, to the greatest known depth, of the geologic formations, beyond what connexion is necessarily inferential from the seismic bands (where they exist) following, on the whole, the lines of mountains and ridges that separate the surface-basins of the earth, whether volcanic or not. While, therefore, the seismic waves diverge, from axial lines that are generally of the older rock formations, and often of crystalline igneous rocks or actively volcanic, they penetrate thence formations of every age and sort, even to plains of the most recent post-pleistocene clays, sands, and gravels; and occasionally, by the secondary efforts of great shocks, these loose materials are shaken or caused to slip and gather up into new forms (as in the Ullah Bund at the mouths of the Indus, &c.), and so the earthquake has come to be mistakenly viewed as a direct agent of elevation. Its true cosmical function is the very opposite: it is part of the dislocating, degrading, and levelling machinery of the *surface* of our globe, while the part of the volcano is restoration and renewal. Both are, however, not creative but conservative (strange as it may sound), and suited to the period of man's appearance and possession of the earth.

Viewing as a whole, and in a single glance, the distribution of seismic energy over the whole globe, it presents (so far as we yet know) a vast loop or band round the Pacific, a more broken and irregular one around the Atlantic, with subdividing bands and a vast broad band stretching across Europe and Asia, and uniting them.

Thus an apparent preponderance of seismic surface seems to lie about the temperate and torrid zones, both northern and southern; but extended observation is yet required in high latitudes, and particularly in the Antarctic ones, before we dare venture to affirm that there is a real preponderance extending over any one or more great climatic bands or zones of the earth's surface.

The following are perhaps the most general conclusions that are at present justifiable:—

- 1st. The superficial distribution of seismic influence over existing terrestrial space does not follow the law of distribution in historic time; it is not one of uniformity. There is this resemblance, which, however, is not a true analogy,—that as the distribution is paroxysmal in time, so it is local in space.
- 2nd. The normal type of superficial distribution is that of bands of variable and of great breadth, with sensible seismic influence extending from  $5^{\circ}$  to  $15^{\circ}$  in width transversely.
- 3rd. These bands very generally follow the lines of elevation which mark and divide the great oceanic or terr-oceanic basins (saucers) of the earth's surface.
- 4th. And in so far as these are frequently the lines of mountain-chains, and these latter those of volcanic vents, so the seismic bands are found to follow them likewise.
- 5th. Although the sensible influence is generally limited to the average

width of the seismic band, paroxysmal efforts are occasionally propagated to great superficial distances beyond it.

6th. The sensible width of the seismic band depends upon the energy developed, and upon the accidental geologic and topographic conditions at each point along its entire length.

7th. Seismic energy *may* become sensible at any point of the earth's surface, its efforts being, however, greater and more frequent as the great volcanic lines of activity are approached.

8th. The surfaces of minimum or of no known disturbance, are the central areas of great oceanic or terr-oceanic basins or saucers, and the greater islands existing in shallow seas.

The fact that certain low-lying river-basins, such as the Mississippi and the Ganges, are the seats of earthquake disturbance, does not conflict with the last proposition. In these cases, the impulse is propagated into the plain from the band of the bounding ridges; and when these are very large in relation to the basin, the breadth of the seismic band may overlap its whole surface,—as for example in the basin of the Ganges, where the seismic banks of the Himalaya and Vindhya mountains cover the whole plain of Northern India.



We have thus extracted all the information that our Catalogue, or indeed any further cataloguing of earthquakes, seems capable of giving us; future research must take a more distinctly physical character. I therefore proceed to some observations upon instrumental seismometry and the construction of seismometers, upon which our future progress must much depend.

Twelve years ago, at the period of the author's paper (Trans. R. I. Acad. vol. xxi. 1846) "On the Dynamics of Earthquakes," the construction of seismometric instruments appeared a comparatively easy matter; there did not seem to be much difficulty in producing even a self-registering instrument that should give every element of the earth-wave at the surface, whose normal velocity of propagation was then assumed to be extremely great, to approximate to that theoretically due to the elasticity of solid rocky media, and not to vary very materially in direction of propagation during its transit from the origin, to any distant point of the earth's surface.

It is only at a very recent period that experiments and observations as to the actual phænomena, the velocity and direction of shock, &c. have begun to show the real difficulties of the subject; and as these are apparently not very generally recognized, I propose pointing some of them out here, prior to indicating the limits within which for the present, it appears to me, we must be content to restrict our seismometric aims and instruments, and describing what form of instrument, and in what localities placed, would appear, with our existing knowledge, the best to give us some information—approximate only, and incomplete without doubt, but yet such as can be made a safe basis for a future higher step with more refined and comprehensive instruments. I shall avoid as much as possible (as out of place in this Report) any mathematical treatment of the subject. The antecedent history of seismometers is in brief as follows:—

All the instruments hitherto devised or set up may be divided into two great classes:—1, *observational*, those whose motions must be observed and recorded after each shock; 2, *self-registering*, which record their own past movements however repeated, and admit of their observation at any subsequent period within certain limits. Each of these classes is again divided into two sorts:—*a.* instruments dependent upon the movements by displace-

ment of liquids; *b.* those dependent upon the partial displacements of solids. Of the first class, there have been—

- 1 (*a*). That of Cacciatore of Palermo, long in use in Sicily. It consists of a wooden circular dish about 10 in. diameter, placed horizontally and filled with mercury to the brim-level of eight notches that face the cardinal points and the bisecting rhumbs between, and are cut down through the lip of the dish, equally in width and depth all round. Beneath each such notch a small cup is placed, to receive such mercury as may be thrown out of each notch by an oscillatory displacement of the main mass of mercury, due to a general oscillation of the whole system. Either the volume or the weight of mercury found in each cup is supposed to measure the value of the displacement, and hence of the shock in its direction in azimuth.
- 2 (*a*). The wooden or other bowl of molasses, or other such viscid liquid, suggested for use by Mr. Babbage.
- 3 (*a*). A cylindric tub with chalked or whitewashed sides, and partially filled with some heavy and permanently coloured liquid of deep tint. (Mallet, Admiralty Manual, sect. vii. p. 218.)
- 4 (*a*). Tubes partially filled with mercury, -shaped, with the horizontal and open limbs directed to the cardinal points, for the horizontal component of shock; and -shaped for the vertical component,—both sets being provided with marking indices, to show previous displacement of the mercury. (Mallet, Admiralty Manual, sect. vii. p. 214.)
- 5 (*b*). The oldest, probably, of seismometers, long set up in Italy and southern Europe. A pendulum, free to move in any direction, carries below the bob a stile partly immersed in a stratum of dry fine sand spread to uniform thickness over the concave surface of a circular dish placed beneath, marked to the cardinal points, whose centre is beneath the point of suspension of the pendulum when at rest, and whose concavity is that of a spherical segment of a radius equal to the length of the pendulum and stile, plus rather more than the depth of the stratum of sand. It was supposed that the stile would mark a right line when seen in a plane vertical to the sand-bed, and in the direction of the shock.
- 6 (*b*). The inverted pendulum, held vertical when at rest by its forming part of a spring at the base (like the watchmakers' noddie), armed with a chalk tracer or pencil above the bob, marking a line or lines upon the concave lower surface of a dish in form like that of the preceding. This was understood to be one of the instruments adopted by the observers of the repeated shocks of Comrie, &c., and the invention, in its improved form, of Prof. J. Forbes. (Phil. Trans. Edin. vol. xv. part 1; Trans. Brit. Ass. 1841–42.)
- 7 (*b*). The inverted spring and ratchet pendulum seismometer, proposed in 1854 by Robert F. Budge, Esq. of Valparaiso, in a letter (12th March 1854) to Mr. Patterson of Belfast, and obligingly forwarded by him to the author. Four cylindrical or square rods of spring steel, each carrying a spherical bob (an iron shot) at top, are fixed vertically. Each is provided with a ratchet, finely cut upon the rod, and a pall, the planes of motion of the four palls passing through the cardinal points, so that each spring pendulum is free to make *one semioscillation* only in its own direction, or that of its ratchet and pall, and be arrested there by the latter until its position of displacement be observed and it be released. Thus, in the figure (2), *p* W is the spring pendulum (which, it may be remarked, would be better a flat ribbon of spring steel,

the broad dimension being transverse to the arc of vibration, than either round or square as proposed), *W* the bob, *r* the ratchet and pall. If we suppose this to be in the N. and S. vertical plane, a shock from the S. may bring the pendulum into the position *p m*, when the pall will fall into that *r n*, and detain the instrument in its new position until the angle *n p W* can be observed.

The main object proposed by the author of this modification of the inverted pendulum was, that the observable movement of the instrument should be as nearly as possible that of the horizontal component of shock, without being perplexed with indications due to subsequent abnormal motions of the instrument.



- 8 (b). The pendulum seismometer of Santi. Two pendula suspended close to the faces of two walls, ranging in vertical planes traversing through the cardinal points, are free to oscillate in those planes only. Each is provided with a chalk tracer, which marks the arc of oscillation N. and S. or E. and W., or *vice versa* as to either, upon the prepared face of the wall. This has been long in use in Italy. The length of the horizontal chord of the arc traced is assumed to be equal to the horizontal component of shock in the direction marked, and intermediate movements are to be obtained from comparison of the lengths of both cardinal chords by the known laws of compounded motions.
- 9 (b). A vertical inverted spring pendulum, formed of an elastic rod (wood or cane), with bobs of iron shot, is fixed within a hoop, with certain extemporaneous means of marking its oscillations in any plane, or more than one, for horizontal component. Such pendula, fixed horizontally in a wall, or in two N. and S. and E. and W. walls, may be used for vertical element, or a shot hung from a spiral spring of wire (Mallet, Admiralty Manual, sect. vii. p. 217, 218.); these were intended for extemporaneous use. The spiral spring arrangement has had several different proposers, some anterior to the above.

Such are the principal instruments of the first class, used or proposed, in addition to which may be noticed the balanced circular dish, or wheel-formed seismometer, suggested, I believe, by Professor J. Forbes and Col. James, R.E.,—a disk of cast-iron or other metal with a heavy rim, upon a central point of suspension slightly above the centre of gravity, and provided with a central tracing-stile, either above or below. The sensibility and power of horizontal recovery or stability of this instrument are nearly identical with those of the common balance. It is liable to all the objections that apply to pendula, whose properties in oscillation it still partakes of; and it is difficult to see any one special advantage offered by it.

Of the second class, or self-registering seismometers, the number is much more limited.

- 1 (a). The first completely self-registering seismometer proposed, the author believes to have been that invented by himself, an account of which

was read to the Royal Irish Academy in June 1846 (*Trans. R. I. A.*, xxi. p. 107). It consists essentially of five fluid pendula,—glass tubes, partially filled with mercury, four for horizontal, and one for vertical elements of the shock. The displacement of the mercurial columns breaks contact, in an otherwise closed galvanic circuit, which, acting upon some simple contrivances, cause a pencil to trace a line upon ruled paper, whose length is proportionate to the time that contact remains broken, or to the amplitude and altitude of the earth-wave. The ruled paper, placed upon a cylinder, is maintained in motion by a clock; the position of the commencement of the pencil line traced on the moving paper, therefore, gives the moment in time, of the arrival of the wave, or initial instant of shock. The displacement of the mercurial columns is dependent upon inertia, and on the relative mass of mercury in the adjacent limbs of each bent tube.

- 2 (a). Professor Palmieri, of Naples, has, some time since, constructed an instrument, in point of general principle, very similar to the preceding, and which has been at work, as he informs me, with satisfactory results, at the Royal Meteorological Observatory upon Vesuvius, and for a considerable period. His instrument consists of two distinct systems, one for vertical, the other for horizontal, or rather undulatory movements. The former consists of a clock, constantly going, and registering *date* and *time*. A galvanic circuit, which includes an electro-magnet, remains always *unclosed*, except at the instant of the arrival of a vertical movement of the whole instrument, when one pole of copper or platinum wire, held suspended from a heavy bob at the lower end of a spiral spring—as in 9 (b), last sentence—close over the surface of a mercurial cup (the other pole), drops by inertia, and making good the contact, establishes the electro-magnet's action, and by it stops the clock and rings a bell. The *range* of vertical movement is, I believe, deduced from the direct motion of this contact-maker.

The system for horizontal (?) or undulatory movements consists of a similar clock and galvanic arrangement, and of four U-shaped glass tubes, open at both ends, and containing equal vertical columns of mercury. The vertical planes of two of these U-tubes are N. and S. and E. and W.; those of the other two in intermediate rhumbs. Close *above*, but not in contact with, the mercurial surface in one limb of each tube, is held suspended a platinum pole, the mercury itself being the other pole of the open circuit. Upon the surface of the mercury in the opposite limb a small float rests, connected by a silk cord over a pulley in a vertical plane, with a little counterpoise, slightly heavier than the float. If, now, such a movement be given to any one or more of these U-tubes as shall *hant it over or throw it out of plumb*, and so alter the relative levels of the opposite surfaces of mercury in the two limbs of the tube, the U-tube that shall incline *towards* the limb that contains the platinum galvanic pole will then make contact, and at the moment of doing so will stop the clock and ring a bell as before.

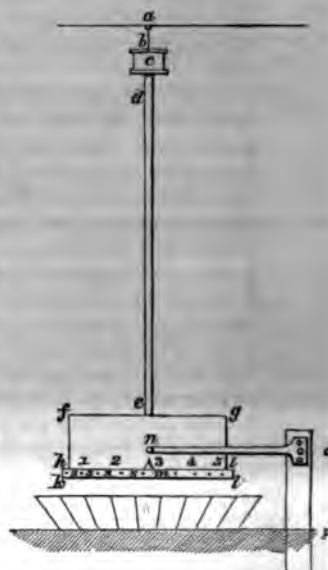
The amount of displacement as to level of the two surfaces of mercury in the opposite limbs will be made observable by the distance to which the small float shall be found elevated above the surface of the mercury in the opposite limb. A description of this instrument has been given, but without a figure, in De la Rive's

'Treatise on Electricity and its Applications,' English edition, vol. iii. p. 508\*.

- 3 (b). The last self-registering instrument to be noticed is that of Herr Kreil of Vienna, of which an account appeared in 1855. This ingenious and simple instrument can hardly be made intelligible more briefly than in the author's own words, which I translate (with the addition of a word or two) from the 'Sitzungsberichte der Kais. Akad. d. Wissensch.' Band. xv. p. 111, Heft for March 1855:—

"A good seismometer is a desideratum still to be devoutly wished for. It should not only show the commencement of the stronger, but also of the weaker shocks, as well as their duration, direction, and strength,—a task which is too great for a self-registering apparatus. Therefore every idea towards the improvement of such instruments must be welcome; and on this account I venture to bring forward the following design (fig. 3). Let  $de$  be a rod of wood or metal suspended at  $a$ , which at  $d$  is fastened to the elastic spring  $c$ , like the pendulum of a clock, and therefore can swing in the plane of this spring in a vertical direction. Let  $ab$  be a second spring upon the first vertical one, which permits the bar of the pendulum,  $de$ , to swing in the plane of the spring  $c$ , i.e. at right angles to the former vertical plane. The bar  $de$  and the weight fastened to it can therefore swing in every direction, without its being permitted to turn on its own axis of vertical length, and as if there were but a thread or thin wire at  $b$ . The cylinder  $fghi$  contains clockwork, which obliges it to turn round upon the bar of the pendulum (as its perpendicular axis fixed with reference to rotation) once in 24 hours. It is covered with paper or other material, which can be marked on without great pressure. It contains on the lower edge the numbers of the hours, which can move behind an index  $m$ , fastened to the plate  $kl$ , which is fixed to the axis of the pendulum. Upon a neighbouring pin,  $op$ , is an elastic and thin arm of brass,  $on$ , which carries a pencil at  $n$ , which, by means of a screw (spring?), can be pressed against the cylinder and removed from it. It is in firm contact with this, and marks upon it an uninterrupted line so long as the pendulum remains at rest; if, however, this begins to swing, in consequence of the whole system being shaken, this line will be broken, and strokes produced which will have a horizontal direction if the pendulum swings in the plane of  $no$ , but will be perpendicular and crossways if swinging in the plane perpendicular to  $no$ . The force and length of

Fig. 3.



\* Since this report was commenced, I have myself had the advantage of seeing this instrument, and conversing with its distinguished inventor, as to its principles and construction. Prof. Palmieri informed me that it had been arrested by the celebrated shock of 16th December 1857, and had given indications that he deemed satisfactory. [R. M., May 1858.]

this stroke will give an approximation to the strength of the shocks. The middle of the stroke, or, if they are vertical, the end of the uninterrupted line, gives the time of the commencement of the shock. The strength and direction of the shocks may also be approximated if the (as respects rotation) fixed plate  $h i k l$  have an annular recess, filled with quicksilver until its surface reaches the holes  $s s s$ , made in the cylindrical sides. At the first motion of the pendulum, the quicksilver will be shed out through these holes into a dish divided into the same number of compartments as there are holes, like those already in use in many existing instruments of this kind (*Cacciatores*)".

Such are the chief seismometers hitherto proposed. They all involve in some form the principle either of the solid or of the fluid pendulum, the latter term being applied to the oscillations of liquids in tubes or other such vessels; and have disadvantages, both theoretic and practical or constructive, which render their indications inaccurate.

Every pendulum seismometer has a time of oscillation due to its length, which in the case of the solid pendulum is

$$T = \pi \sqrt{\frac{l}{g}},$$

and in the case of the oscillating liquid

$$T = \pi \sqrt{\frac{0.5l}{g}}, -$$

$l$  being the length of the pendulum and of the oscillating column of liquid respectively; but if  $P$  = the period of the earth-wave or shock, then whenever  $T = P$ , or  $n \times P$ , or  $\frac{P}{n}$ , the indication of the instrument will be in excess

of the horizontal component of the wave's motion; when, on the contrary,  $T$  represents no function of  $P$ , it may be much less than it.

The amount of error depends also upon the velocity of movement of the horizontal component of the wave. If this be considerable, the solid pendulum, whether hanging or inverted, acted on by gravity or elasticity, is at the first moment left behind; as the rod becomes more oblique, the pendulum is *dragged* along, and acquires a velocity (in a direction which approaches to horizontal) greater than that due to the arc through which the pendulum has fallen in the time. At the end of the wave's forward movement, then, the pendulum is thrown forward too far; and at the end of the return movement of the wave, it moves beyond the range of the latter, by a small arc due to its proper motion. This objection applies, though with less cogency, to the fluid pendula, and in their case to both the vertical and horizontal components of the wave.

These discrepancies of indication will vary whenever the velocity and dimensions of the earth-wave become altered; and as, for the same instrument,  $T$  varies with  $\sin^2 \lambda$  ( $\lambda$  being the latitude), it is obvious that even two perfectly similar instruments at stations north and south of each other, will not give strictly comparable results for the same earth-wave.

These are but examples of one or two points of theoretic difficulty, to which others might be added, and which affect these instruments principally as indicators of the dimensions of the earth-wave. Some of these theoretic disturbances may be eliminated by calculation from the results; but there are also some apparently insuperable difficulties, of a practical or constructive nature, which affect all solid pendula as reliable indicators even

of the direction of surface-transit (horizontal component) of the earth-wave. However finely suspended the pendulum—if acted on by gravity only, or, however constructed if by elasticity or by elasticity and gravity, it is found impracticable to produce an instrument that shall make even the second half of its very first complete vibration strictly in the plane of the original disturbance, *i. e.* in that of the wave's transit. If, for example, any one of the

Fig. 4.



instruments 5 (*b*), 6 (*b*), or 7 (*b*), be caused to make a semivibration by a movement of the nature of one horizontal jerk, and strictly in one vertical plane *ab* (fig. 4), the trace made will in most instances be found thus: *cd*, the first semivibration, is made sensibly in the plane of movement, but the returning complete vibration *de*, is found diverging from it through a sensible angle *cde*. If the vibration of the instrument be suffered to continue, its trace rapidly becomes an extremely elongated ellipse, whose excentricity constantly diminishes, as well as the actual dimensions of both its axes, until the instrument comes to rest, after tracing thus a mass of elliptic spirals, from which nothing certain can be gathered as to direction in some instances—in which, at best, it is only possible to arrive at a probable direction of originating impulse, by drawing a mean major axis through all these closed curves.

Constructively, this evil arises not only from the nature of the suspension, if a pendulum of gravity, or, if one of elasticity, from the form, material, &c. of the suspending or supporting spring; but also, in both sorts, from the fact that it is practically impossible that the point of suspension (or, in the spring, its centre of resistance), the centre of oscillation, and the resultant of the various opposing forces of the stile or tracing-point, shall lie in one vertical plane, and that that plane shall always coincide with that of the wave's movement; and hence lateral divergence of the pendulum and elliptic spiral oscillation. But it is also partly due to the nature of the earth-wave motion itself, which is never a purely normal one, but always more or less disturbed by small transversals; so that the initial movement impressed upon the pendulum is really not exactly that of the wave's transit. Before entering further, however, upon the subject of the actual perturbations of the superficial earth-wave, as now known, and their effects in relation to seismometers, some remarks may be advisable as to the special objections which I have either observed or experimentally ascertained in respect to each particular arrangement of the seismometers already described.

- 1 (*a*). The Cacciatore mercurial dish.—If the earth-wave emerge with a considerable angle from the horizon, and large velocity, the mercury first surges up at the side of the dish towards which the earth-wave is in transit, and in the direction opposite to its motion; it then, after spilling out some of the mercury, commences its return oscillation, moving in the same direction as the earth-wave, and spills out another portion at the opposite side of the dish. The sum of the weights so spilled out, taken at either side of a diameter transverse to the earth-wave's vertical plane of transit, will vary with every change in the angle of emergence, or in the velocity or in the dimensions



of the earth-wave. Small transversal vibrations, arriving almost along with the earth-wave, as well as the effects of the form of the dish, and of its delivering-spouts or adjutages, disturb the initial simple surge of the mercury across the diameter of the dish, and produce reflected and other secondary surge movements of the mercury, which traverse round the circumference of the dish, and spill out more mercury in irregular gulps. The final result is, that no reliance whatever can be placed upon its final indication, as to the plane of the earth-wave transit having passed through the centre of gravity of that semicircle of cups which are found to contain the most mercury. The result is not materially different if the line of transit of the earth-wave be perfectly horizontal. This instrument gives no information whatever beyond a most uncertain approximation to the direction of the horizontal component of the earth-wave transit.

- 2 (a). The same objections generally apply to this form of instrument, and one in addition, viz. that a viscid liquid like molasses must always give indications short of the truth as to excursion in the dish due to any given shock, and the more so as it is more tenacious and approaches nearer to a solid; and as we have no correct means of measuring viscosity, even assuming it constant for the same liquid, nor any certainty that the specific gravity of such liquids remains constant (it is certain *molasses* will not remain of the same density in any climate for any considerable length of time), so observations made through their means at different times and places can never be comparable.
- 3 (a). The same objections that apply to 1 (a) apply to the tub of coloured water, but in a mitigated degree, the diameter being large, the volume and depth of the liquid great, and the cylindrical sides of the tub free from any apertures or inequalities. The initial surge gives a much more distinct indication of direction than in either of the preceding instruments; and it does not very frequently happen that a diameter may not be found approximating, with tolerable certainty, to the plane of earth-wave transit. But in cases where the normal wave is preceded or accompanied by very appreciable transversals, those *violent tremors* that are now known as the frequent accompaniments of the actual shock—the water-tub seismometer will give no indication, or an uncertain one, unless watched and remarked as to transit-direction at the instant of the occurrence of the shock.
- 4 (a). Tubes partially filled with mercury give almost unobjectionable indications as to *direction* of transit. Their evils are too great delicacy or sensitiveness, for the observation of that class of earthquakes of mean power, which are the most important to be studied, and by which they are completely deranged occasionally, while they are continually being disturbed in such a seismic region by small tremulous movements that are unimportant to notice. As respects their indications of velocity and dimensions of the wave, they are liable to the objections already noticed as applicable to all pendula.
- 5 (b) and 6 (b). The main disadvantages of these constructions, viz. the suspended and the inverted solid pendulum have been already pointed out; it may be added here, however, that with the inverted pendulum of Forbes, the supporting spring is more or less crippled down, by a sharp vertically (or nearly vertically) emergent shock, which gives a lateral movement (greater or less) to the pendulum, as though

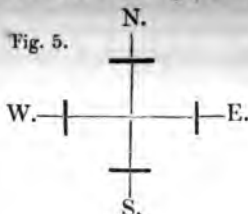
from a horizontal originating motion, so that the instrument gives in such cases an absolutely false indication.

- 7 (b). Mr. Budge's inverted spring pendulum, restrained to a single semio oscillation in one plane, offers some decisive advantages over any other form hitherto proposed of the pendulum seismometer. The whole length of the pendulum is elastic; and the rod being light the whole weight by whose inertia it is bent may be considered as in the ball or bob. If  $\Sigma$  be the moment of resilience of the rod, and the deflection be not very great, the angle  $\omega p n = \theta$ , then—

$$\Sigma(L \tan \theta - b) = \frac{FL^3}{3},$$

$L$  being the length, and  $b$  the horizontal ordinate of deflection of the pendulum. It is plain that although, like every other elastic rod, this will have a time of vibration of its own, and be therefore liable to part of the theoretic objections made to the simple pendulum on the same account, this form of pendulum will be "brought up" much more nearly within the true limits of the earth-wave amplitude in its horizontal component.

Perhaps the ratchet and pall may not be the best mode, practically, of arresting its movement at the end of its first semio oscillation, with sufficient delicacy, and other methods are obvious that may be applicable; but if the elastic rod be a flat plate of sufficient breadth in relation to its thickness, and each rod or pendulum (of the four) be so placed, with reference to the cardinal points, that its broadest dimension shall be transverse to its normal plane of flexure, it is the obvious that practically we may neglect any flexion of the rod *edgewise*, the four rods in section being posited thus (fig. 5)—



and that thus we obtain a flexure, for each pendulum, practical limited to its own vertical plane of oscillation, and so can obtain, for any intermediate line of wave-transit between the cardinal points, a good approximate resultant direction from the two adjacent component deflexions. Perhaps a flat ribbon-like rod of tempered steel whose section should be a rectangle, with sides having the proportions of about 30 : 1, would be better than an elastic wooden lath; and in either case, it is probable that a tape or silk ribbon, fastened at the side  $r$ , and passing with friction through a small horizontal slot in the elastic rod, so as to be stretched by its deflexion and pulled through the slot, would be the best and simplest mode of registering the deflexion, at the angle  $\theta$ .

While this appears to me the best of the solid-pendulum arrangements, I do not wish to be understood as recommending any one of the class.

- 8 (b). Santi's arrangement is of course subject to the objections made to the pendula. It possesses some advantage in separation of the results

different azimuths, and therein in clearness of indication; but it also has special disadvantages of its own. If, for example, the line of earth-wave transit be from S. to N., and the E. and W. pendulum be set up at the S. side of its own wall, it will tend to be thrown off or out from the wall by the shock; if placed on the N. side of its own wall, its friction will be increased on its suspensions, and tracing-point, by its being thrown in or pressed against the wall; and if the line of earth-wave transit be, say N.W. and S.E., both pendula will be either thrown out from or pressed in against their respective walls, according to which side of the N. and S. walls they be fixed at. This source of variable inaccuracy might perhaps be eliminated by a double set of pendula, viz. one at each of the opposite sides of the N. and S. and of the E. and W. walls, which would thus be oppositely affected (in excess and in defect) by this source of error.

- 9 (b). What has been already stated, with reference to errors common to all pendula, and the remarks made under 7 (b) as to the superiority of elastic over simple pendula, render it needless to enlarge on those which were only proposed as extemporaneous instruments, and for which they will be found convenient and useful, and not more inaccurate than much more elaborate ones.

Referring now to the second class, or self-regulating instruments,—the disadvantage of the one

- 2 (a), proposed by the author is of the same character as that of 4 (a) of the first class, viz. too delicate a sensitiveness to small tremulous shocks, which derange the composure of the instrument, without its giving decisive indications. The galvanic recording part of the apparatus was all that could be desired, and is of-course applicable to other forms of instrument as respects the displacement portions. Indeed, apparatus identical in all its main characteristics has been since brought into successful and constant use by Professor Airy, Astronomer Royal, for the registration of astronomical and other kindred observations, and also by several experimenters abroad. An account of many such arrangements will be found in De la Rive's 'Treatise on Electricity.'
- 2 (a). The same remark, I think, may apply to Professor Palmieri's seismometer, with this addition: the movement of the mercury, equal columns of which are contained in the opposite legs of each U-shaped tube, depends in his instrument *wholly* upon the U-tube being *canted over* more or less in its own plane, so as to throw the legs of the tube out of plumb. This, Professor Palmieri (if I do not misunderstand him) considers an inevitable consequence of the transit of the earth-wave at the instrument, conceiving the earth's surface to suffer, in every case, such a sensible heaving undulation, as to rock the instrument upon it, like a ship upon a heavy ground-swell. I must confess to entertaining great doubts that, in the great majority of earthquakes, any such sensible undulation (enough, at least, to produce a sensible throwing out of plumb of the U-tubes) can occur, although I have no reason to doubt that, from its delicate sensitiveness, contact will be broken, and the instrument act in so far, by some of the violent jars or jerks that it may receive. This peculiarity constitutes, in fact, the essential difference in arrangement between the author's seismometer and Prof. Palmieri's. In the former the

mass of the mercury is in unequal columns in each tube, so that its displacement is dependent solely on inertia; it therefore sympathizes with the movement of the earth-wave, emergent in whatever way; in the latter, the correctness of indication of the instrument depends not at all on the inertia of the mercury, but simply upon the alteration of relative surface-level in the opposite legs of the U-tubes, when the latter are thrown more or less out of plumb by the supposed undulation of the earth's surface at the transit of the shock.

- 3 (b). Kreil's ingenious instrument is not devoid of some serious objections. It partakes of those common to all pendula; and these will be further perplexed when the annular dish *h i k l* is filled with mercury, which will form a second (fluid) attached pendulum with a time of oscillation of its own, and differing largely from that of the pendulum which suspends it. Very little value, however, can be attached to the indications to be afforded by the very small amount of mercury that can be caused to spill out, owing to the very small arc of oscillation that the whole instrument can be afforded to make by construction. The most serious objection, however, lies in the method of flexible suspension adopted for the whole pendulous part of the instrument, viz., by two *short* thin plates or ribbons of tempered steel, whose respective vertical planes are at right angles to each other, the object being to *allow of oscillation* in any direction, but *prevent rotation* upon the vertical axis. Whenever a somewhat energetic disturbance shall be given to a pendulum so suspended—so as to cause oscillation in a vertical plane, diagonal to the crossing planes of the two suspending ribbons, *torsion* of each of these arises, and violent twisting movements (by jerks) of the pendulum itself result, producing sudden, jerking, rotatory oscillations of the bob (the cylinder containing the clockwork, &c.) round the axis of the pendulum. These must of course interfere with and derange any true results as indicated by the tracing-pencil, which must also record all such accidental moments, and probably derange the rate of the clock.

There does not appear, however, to be any insuperable difficulty in devising another mode of suspension for the instrument, that might at least remove this defect.

Such are some of the main objections to the seismometric instruments themselves, hitherto proposed. It remains to consider the difficulties introduced by the nature of the movements we require to observe and record with them, as they actually take place in nature. What we want to find is the true direction of emergence of the normal earth-wave, with its dimensions and velocity, at a given point upon the earth's surface. This, were the earth a perfectly homogeneous elastic solid, though much easier, would still be attended with grave difficulties; one of these, which must ever remain *instrumentally* insuperable, consists in the fact that the emergent wave on leaving the free outlying stratum of the earth's surface, differs both in dimensions and in velocity from the same wave in the previous parts of its deep transit. Future and more perfect knowledge of the laws of imperfectly elastic bodies in wave-transmission will, it may be expected, enable us to calculate the latter from the observed final part of the transit.

Far, however, from being homogeneous, every portion of our earth's crust that we are acquainted with consists of various "couches," or masses of materials, differing in elasticity, density, and degree of discontinuity, in the character, directions, and openness or closeness of the discontinuant fissures,

in wetness or dryness, in temperature, and in many other ways. Stratification and lamination, with their transverse master-joints, affect the elasticity of whole mountain-ranges and profound masses of the land, and cause it to differ in different directions.

The mass beneath our feet is very often not even approximately solid. Vast beds and cavernous recesses occur, empty, or filled more or less with water, sometimes with lava, ignited rock, and steam at enormous temperature and tension; and, for anything we as yet *know*, scismometry may require to deal with depths and masses where the solid has passed, with exalted temperature, into the imperfectly liquid state.

Again, the *surface* of our earth is everywhere more or less uneven, and, viewed over large areas, such as earthquake-transit is concerned with, is ribbed with rigid mountain-chains, often intersecting or abutting on each other, channeled by valleys, river-courses, deep estuaries, and bays, excavated into basin-shaped hollows often long and narrow, sometimes filled with unconformable rock or with loose and incoherent detrital material, and intersected to unknown depths by dykes, veins, and faults. The result of these differences and disturbances of internal structure and superficial features is to produce perturbations in the surface emergence of the earth wave, often of the most amazing and perplexing character; and it is not until the nature and extent of these have been realized to the mind, that we shall be enabled to choose the best form of seismometric observation, to determine upon the only proper sites for the establishment of instruments, and to see within what limits our first researches must be confined.

Let us notice, then, a few examples of striking surface-perturbation, of direction, of the great earth-wave, already on record.

Savi ('*Relazione di Fenomeni presentati dai Terremoti di Toscana, dell' Agosto 1846*,' p. 32-44) and Pilla ('*Istoria del Tremuoto che ha devastato paesi della Costa Toscana il dì 14 Agosto, 1846*,' p. 48-54) have both recorded examples of horizontal apparent movement of the earth-wave in directions orthogonal or even actually opposite to each other, and at points within very limited distances from each other, while, on the whole, there was no doubt of a ruling general direction of horizontal movement over the whole region. I can merely refer to their relations, as scarcely admitting of condensation intelligibly.

M. Perrey, in his '*Memoir on the Earthquakes of France, Belgium, and Holland*' (*Mém. Cour. de l'Acad. Roy. de Brux. tom. xviii.*), under date of 5th July, 1841, has recorded a still more remarkable instance of surface-perturbation, which the small map (Plate XII.) of the northern and part of the central region of France, with outlines of the departmental divisions, illustrates. Those departments in which this shock was felt are marked by numerals referring to the following table. The directions of the horizontal component of the shock, as observed at the several places named, are shown on the map by a short thick arrow. A few other places where the shock was felt, but direction not observed, are marked by a large dot, and the name referred to by a letter. A few large towns, and the general range of the hilly country (running mainly in a N.W. and S.E. direction) between the two great seats of disturbance, are marked in mainly as general guides of position to the eye. This earthquake was sufficiently powerful to disturb furniture, move objects visibly, and affect clocks, &c., and was variously reported to have lasted in different places from two or three, to ninety seconds of time.

Number on Map.	Department.	Locality.	Direction of Horizontal Component.
1.	Seine .....	City of Paris .....	N.E. to S.W.; three shocks.
		Sèvres .....	W. to E.; three shocks.
		Chevreuse .....	N.E. to S.W.
		Longjumeau, <i>m.</i> .....	Direction not given.
2.	Seine et Oise .....	Rambouillet .....	W. to E.
		Grignon .....	N.E. to S.W.
		Orsay .....	S. to N.; seven shocks.
		Meulan .....	N. to S.; three shocks.
3.	Loiret .....	Nogent .....	N. to S.
4.	Loire et Cher .....	Quincy .....	W. to E.
5.	Indre et Loire .....	Caumacré .....	N. to S.
6.	Indre .....	Lange .....	S. to N.
		Le Blanc, <i>n.</i> .....	More than one shock; direction not given.
7.	Cher .....	Bourges .....	Vertical (soulèvement); two shocks.
8.	Eure et Loire .....	Chartres, <i>p.</i> .....	One shock; direction not given.
9.	Seine et Marne .....	Donnemarie .....	S. to N.; three shocks.
10.	Eure .....	}	No record of the shock having been felt in either of these departments.
11.	Oise .....		
12.	Côte-d'Or .....	Bligny-sur-Orche .....	Three shocks; direction not given; very severe.

Here, then, we have two very limited but separated earthquake districts—one around Paris, the other more widely spread around Tours—and a third to the S.W., stretching into Côte d'Or, in which we have the observed or horizontal direction of shocks from N. to S., from S. to N., from W. to E., and from N.E. to S.W., and in one place said to be vertical. In the Paris district the extreme distance apart of the places of observation does not exceed 30 English miles, the average being under 15 English miles.

In the Tours district the extremes are under 70 English miles apart, and the average distance under 30 miles. The central part of one region is not more than 150 miles from that of the other; and neither district is more than about 70 miles distant from the axial line of the chain of hills that separates them, and in the prolongation of which to the S.W. the third district is widely spread, taking the general line of axial direction.

Making every abatement that imperfect observation can justify, there remains abundant proof, in this example, that even in places within view of each other as to distance, but situated over heterogeneous formations, and in a country of broken and irregular surface, the superficial direction of shock may present anomalies at first sight apparently admitting of no analysis, and in any case incapable of giving any direct information as to prevailing direction, or position of focus, by mere seismometric observations.

The third and last example we shall take from India, as one not devoid of a larger interest also. In the map (Plate XIV.) a very rude outline is given of the geological formations of India, in a merely seismic relation however, *i.e.* with reference to relative hardness, density, and elasticity of the rocky masses,—thus distinguishing them only into the six great divisions of crystalline or granitoid, old stratiform, secondary (from carboniferous to cretaceous), tertiaries, alluvial plains, and some igneous porphyries, diorites, &c. In the colouring of this I have to acknowledge the kind assistance afforded me by Professor Phillips. This map has been fully described in "Second Report on the Facts, &c." (Brit. Assoc. Trans. for 1851, p. 313 *et seq.*), where it should have appeared originally, but was, at a late moment, prevented by an accident connected with its completion. I shall therefore, referring the reader to the former report, merely notice here the facts as relating to seismometry.

The great earthquake of 1819, which extended its influence right across this peninsula from Calcutta to Cutch, and during which the Ullah Bund was elevated, and the Runn of Cutch submerged—the former a low mass of sand and clay seventy miles long, about fifteen miles wide, and elevated about 10 feet; and the latter an area of subsidence of about 2000 square miles—had a great general line of horizontal propagation of shock, as shown by the heavy red line, of nearly from W. to E., a few degrees to the S.E.; yet at Calcutta it was felt from N.E. to S.W., and at many places along this immense line—situated between the Aravulla and Vindhya chains of mountains, as for example at Rampura—the great shock was felt in directions quite transverse to the principal line.

So also the general line of horizontal direction of the great earthquake of 1833, whose origin was far beneath the Himalayas to the E. and N., had a great general direction about that shown by the long red arrow line. At Katmandu, in the mountains, the shocks were more directly E. to W., and also (reflected shocks probably) from the ranges to the N., which had a direction nearly N.E. to S.W., while in the great plain of the Ganges the observed directions were various, and, without a more complete knowledge of the geology and surface-configuration of the country, perfectly unanalysable, in some places N. to S., and at others, sixty miles off, from E. to W.

While we must regard many of these observations as deserving of little stress as to accuracy, enough remains to prove that perturbations in the main directions of emergence at the surface of the normal earth-wave, due to heterogeneity of structure in depth, and to inequality of surface, principally, are of such a nature, as to render a special choice of district necessary in attempting any seismometrical researches (even with perfect instruments) which have in view the determination of the position of the focus of disturbance. This choice, according to our present knowledge, must be determined by the following conditions:—

1. The whole surface-area of observation, and to as great a depth as possible, must be uniform in geological structure.

If of stratified rock, not greatly shattered and overthrown, but (viewed largely) level or rolling only. The harder and more dense and elastic the formations, the better, but neither intersected by long and great dykes, nor by igneous protrusions of magnitude, nor suddenly bounded by such formations.

2. The surface must not be broken up into deep gorges, and rocky ranges, and valleys. Seismometry, in a high and shattered mountainous country, can scarcely lead to any result but perplexity. If the surface be deeply alluvial all over, it is less objectionable than valley-basins, and pans of deep alluvium, with rocky ribs between them.
3. The size of the area chosen for observation must bear a relation to the force of the shocks experienced in it. *Moderate shocks are always best for observation, and, in large areas of the most uniform character of formation and surface, will give the most trustworthy indications.*
4. If several seismometers be set up in the area, they should be all placed on corresponding formations, either all on rock, or all on deep alluvium. The rock, when attainable, is always to be preferred. Three seismometers, at as many distant stations, will be generally found sufficient, if the object be chiefly to seek the focal situation and depth.

Having now cleared the way by stating the difficulties of seismometric observations, 1st, as respects the instruments themselves, 2nd, as respects

their local emplacement, it remains to describe the instruments that appear to me the best calculated for the attainment of the objects we can at present propose to ourselves in seismometry, and to point out how such may best be applied; as also some indirect methods of arriving at the most important and interesting primary result, that we are entitled to expect in the first instance from such researches, namely, an approximation to the actual depth of focus within the earth, from which earthquake-impulses are propagated to the surface.

Were it possible to construct a perfect seismometer, it should record simultaneously, 1st, the movements, both horizontal and vertical, of the elastic wave itself, viz., the excursion or amplitude, the altitude, and the maximum velocity in the coordinates  $x$ ,  $y$ , and  $z$ ,— $z$  being vertical; 2nd, the movements of translation of the "advancing form" or wave itself at its emergence upon the earth's surface, with the velocities in the corresponding coordinates  $x_2$ ,  $y_2$ , and  $z_2$ .

These involve alone twelve equations of condition; and we *assume* that the elastic medium (the earth) through which the wave is transmitted, is homogeneous, in density and elastic modulus; and that the final wave-movements, of the free outlying stratum at the surface, obey the same laws as do those of the successive "couches" beneath.

Generally, we must assume the elasticity perfect, and that the *vis viva* of any particle in motion,  $\Delta m$ , is determinable from its velocity at its position of equilibrium. From the general equation of wave-motion

$$v = a \cos \left( \frac{2\pi}{\lambda} (x - at) \right),$$

we have the velocity at any point where  $a^2$  is the intensity,  $\lambda$  the amplitude,  $a$  the transit-rate or velocity of propagation,  $x$  the abscissa, and  $t$  the time.

At the position of equilibrium  $v = a$ , and the *vis viva* of the particle  $\Delta m$  during the whole undulation is  $\Delta m a^2$ , and proportionate to  $a^2$ . The wave we must suppose emanating from a central point, and propagated outwards in all directions alike, in imaginary, concentric spherical "couches." The *vis viva* must remain constant during the whole propagation. The velocity of propagation  $a$  is also constant; and *the mass of the medium in wave-motion at any moment of the translation is the same*; so that, if  $r$  = the radius of any such spherical "couche," the work done in it by the wave is proportionate to  $r^2 \times a^2$ , and constant for the whole transit,  $a^2$  being  $\propto a \frac{1}{r^2}$ . As, therefore, the mass in simultaneous undulation is constant, the

thickness of each imaginary successive "couche" must decrease as  $r^2$ ; and so the displacing power of the wave diminishes also as  $r^2$ , and the work done by the wave within any such "couche" of determinate thickness =  $\Sigma \frac{1}{2} \Delta m a^2$ ,—or  $M$ , being the mass in simultaneous undulation, =  $\frac{1}{2} M a^2$ .

The wave at its origination, starts in any radius, with one normal and two transversal vibrations, the separate determination of which would require a corresponding increase in the number of equations for  $x$ ,  $y$ , and  $z$ ; and in the recorded facts by the instrument. It is obvious, then, even with the utmost simplifications we can assume as to the molecular condition of the medium (the earth), that practically we must be content with a seismometer that shall record only some of the more important conditions of the earth-wave, and in such a manner as shall enable us, indirectly, to arrive at others. And in considering the relative importance of the several elements, the maximum velocity of the wave at its point of emergence upon the surface, with the



directions in  $x$ ,  $y$ , and  $z$ , or the horizontal components ( $x$  and  $y$ ) of the direction of motion and the vertical component  $z$ , will be found the most valuable.

These are determinable by one instrument only. By two or more such, at separate and moderately distant places, the velocity of propagation or transit-rate  $\alpha$  may be found; and by combining the results obtained by both, in calculation, each may be made to check and control the other, and for a given seismic region (apart from serious perturbations of internal formation) we can obtain the point upon the surface, vertically above the origin of the wave, and approximate to the depth of the origin itself, or of the focus of disturbance, below the earth's surface.

One or other, of two distinct seismometric arrangements, may be adopted, both dependent upon similar principles,—the second being of a simpler and less expensive character, but not susceptible (as a *single* instrument) of indications as accurate as the first, yet, as respects applicability to determinations of *time* (as one of several, set up in a given seismic area), quite as exact.

I proceed to describe the construction of both, their principles and action.

The first instrument is exhibited in Pl. XV. figs. 1, 2 & 3. Fig. 1 is a lateral geometric elevation of the instrument, whose length is placed in the direction N. and S., as seen in plan in fig. 2,—a precisely similar instrument being placed at right angles of azimuth to it, or with its length E. and W. The same letters of reference apply to similar parts in all the figures. Fig. 2 represents both the N. and S. and E. and W. instruments as placed in position,  $w$  being part of the external wooden shell or wall of the seismic observatory, which may best be always of wood, or such material, and circular in form.

In figs. 1 and 2,  $aa$  is a cast-iron tabular bar, whose upper surface is horizontal, and whose long parallel edges are either N. and S. or E. and W. It is attached to a rigid cylindrical vertical bar of wrought iron,  $b$ , which passes freely, but without shake, through bored holes in the top and bottom collars of the heavy cast-iron frame  $cc$ , which is firmly bolted by its bottom flanch to the heavy stone floor of the observatory; or, if the latter can be so placed, to the natural solid rock when levelled to form its floor. Beneath the frame  $cc$  is a pit,  $pp$ , for convenience of access to the bottom of the instrument. Upon the vertical bar  $b$ , a collar is fixed of wrought iron,  $k$ , between which and the lower bored collar of the frame  $cc$ , a spiral spring,  $e$ , is placed, having its axis coincident with that of the bar  $b$ .

This spring sustains, when at rest, the weight of the bar and table  $aa$ , and of all resting upon it, and is so adjusted as to resistance, that such forces in the vertical direction, as it may be expected the instrument will be exposed to at any time, shall not be able to compress the spring to such an extent, as to bring the lower surface of the table  $aa$ , into contact with the top part of the frame  $cc$ . A vertical "feather," let into the bar  $b$ , prevents it, or its superior attachments, from altering their position with reference to the frame  $cc$ , by turning round the vertical axis of the bar  $b$  in its collar-bearings.

A small sliding index, not shown in the figure, also moves in a longitudinal groove at the opposite side of the bar  $b$ , and, being placed in contact with the top of the frame  $cc$ , when the whole is at rest, indicates the extent of any vertical depression of the bar  $b$ , and of its load, by compression of the spring  $e$ . A buffer collar of vulcanized india-rubber is placed at  $l$ , above the iron collar  $k$ , as a precaution against a jar, in case of the sudden removal of part of the load on  $aa$  by any accident.

Upon the upper side and centre of the length, of the tabular bar  $aa$ , is

cast a hollow quadrilateral prism,  $g$ , which will be called "*the block*," provided with four "lugs" to receive the pivot-screws  $n, n, n, n$ . The table  $a a$ , supports two similar cast-iron inclined planes  $i, i$ , having for their entire length the trough-shaped section as shown in fig. 3. These planes are fixed to the table  $a a$ , by the pivot-screws  $n, n$ , and by the adjusting-screws  $m, m$  beneath, so that by means of the latter, the inclination of either plane may be altered or fixed, being otherwise free to rotate in a vertical plane, within certain limits, round the pivot-screws  $n, n$ , so as to alter the angles of inclination.

Upon each of these inclined planes, is placed a large heavy ball, formed of a hollow sphere of hard gun-metal, of about 0.3 of an inch in thickness, truly spherical and polished outside, and filled up solid with lead. These balls are adjusted in diameter, to the breadth and form of the inclined planes (as in fig. 3), so as freely to roll along, with but two points of contact.

When the planes  $i, i$  are adjusted at equal inclinations, the balls  $B, B_2$  rest at their lowest ends, and are laterally in contact with, and supported by, the hard wood stops  $r, r$ , driven (from outside inwards) through, and well-fitted in, corresponding rectangular horizontal "slots" in opposite sides of the block  $g$ ,—the end of each wood stop being curved to fit the surface of the balls, in a horizontal great circle, and so that the plane of the stop passes through the centre of gravity of the ball. Through each wood stop there pass the  $\epsilon -$  and  $\epsilon +$  extremities of a galvanic conducting-circuit of thick copper wires, placed at about an inch apart, where they pass parallel to each other, through the wood stop, with their extreme ends coinciding with the surface of the stop next the ball, and being amalgamated; so that while ever the ball reposes in contact with the wood stop, the galvanic circuit remains *completed, through the ball*, between the ends of the wires, but is broken the moment the ball is removed from contact with them.

For one complete seismometer there are two such instruments as have been thus described,—one placed, as in fig. 2, in a N. and S., and the other in an E. and W. direction, as respects their length, and having thus four inclined planes and balls, each with its own distinct galvanic circuit from one common battery. A clock placed in the observatory carries round a cylinder with ruled paper, and each of four pencil markers continues to describe an unbroken line thereon so long as the balls are in contact with the blocks (or wood stops and galvanic poles); but (by an arrangement precisely similar to that described for my fluid pendulum seismometer—*Trans. Roy. Irish Acad.* vol. xxi. p. 107) the moment any ball ceases to be in contact with the block, and for as long as it is so, the pencil is withdrawn, and leaves a break in the otherwise continuous line traced by the rotation of the paper. No part of this clockwork registering-arrangement is shown in the Plate, as several modifications of it are practicable, and no one in particular is essential to the principle of the seismometer before us.

To illustrate the mode of action of the instrument,—returning to fig. 1, suppose it to be the N. and S. one, and adjusted so that the bar  $b$  is truly vertical, the parallel sides of the inclined planes  $i$  and  $i$  truly *in directum*, their angles of inclination to the horizon the same. Then if the arrow  $Q$  represent the direction of emergence of an earthquake-wave (supposed here to be in the plane of the meridian, and from S. to N.), at the first instant that the wave reaches the instrument, the bar  $b$ , and table  $a a$ , with all they carry, will commence to descend and to compress the spring  $e$  by their inertia, with a velocity dependent upon the vertical component of the wave, which carries up the frame  $c c$  vertically. Also at the first instant of arrival of the wave, the ball  $B_2$ , in virtue of its inertia, will move off from the block

towards  $C_1$ ; and *the instant of its departure, by breaking galvanic contact of the poles at its stop, marks that of the commencement of the shock.* But the whole instrument is carried forward by the horizontal component of the shock, and *then moves back again*; the ball B is therefore carried forward also, urged by the block at  $r$ , and is caused to roll up along the inclined plane a certain distance, say to C, where it comes to rest, and, reversing its motion, rolls back again by gravity, and returns to rest in contact with the block and galvanic poles of its own stop. *The ball which first moves*, which we may call the Time Ball (as indicated in time by the pencil trace on the clock-cylinder paper), will *always be that at the side from which the shock arrives.* We neglect any account of its subsequent motions. The other ball, which we may call the Element Ball, by its movements gives us the elements of the wave. The instrument records *the whole time* that it is out of contact with the block  $g$ , viz. that of its excursion up and down the inclined plane  $i$ . If, in place of the wave having emerged at some angle to the horizon from S. to N., it had come at the same or at any other angle of emergence between vertical and horizontal, in the reverse direction or from N. to S., then the action of the balls also would have been reversed, B becoming the Time Ball, and being *left behind*, and thus noting the moment of arrival of the wave; and  $B_1$  being thrown up along the inclined plane  $i$ , giving its elements.

Again (referring to fig. 2), if the wave emerge at some azimuth between N. and S. and E. and W., suppose from the S.W., with any angle of emergence, then by the vertical component the springs of both the N.S. and E.W. instruments will be compressed (and nearly alike). The time balls  $B_1$  of the N.S. and  $B_2$  of the E.W. instruments will be left behind, as before, (and both at the same instant will break contact with the block); and the element balls B and B will be thrown forward upon their respective inclined planes, as before—to equal distances in the case of the exactly intermediate azimuth here supposed, but to unequal distances if this azimuth be more to the W. or to the S. The instrument records the simultaneous excursions of both balls B and B, giving the total time (as before) that each ball is out of contact with its own block or stop; and if the direction of the wave-movement be reversed as respects the instrument (suppose, from some point of N.E. towards S.W.), then the respective movements and functions of the balls will also reverse themselves, B and B being left behind, and  $B_1$  and  $B_2$  thrown forward, &c.

The general size and strength of the instrument must be determined with reference to the degree of violence of the earthquake-shocks to be anticipated in the seismic region it is intended for. The very greatest, and the very smallest perceptible shocks, are alike unsuited for useful measurement. The dimensions of the instrument, as shown by the scale of the plate, are such as I consider fitted to ensure its functions, under the effects of those shocks of mean intensity (such for example, as those common in the Mediterranean basin, or in those of Hungary and Austria), and with moderate vertical angles of emergence, which are those best to observe in the existing state of our knowledge.

The most important points of precaution of a constructional character to be noticed are the following:—The balls should be of lead chiefly (the surface being formed, for hardness and smoothness, of gun-metal), to reduce their proper elasticity as much as possible. The inclination of the planes  $i$ ,  $i$  must be small, probably never exceeding  $15^\circ$ , and the length and inclination so adjusted by experiment, to the maximum time of wave-oscillation in the district of observation, that the whole time of rolling up and down of the ball shall be considerably longer in duration. Their bearing-edges must be per-

fectly parallel and smooth; and the length of the planes must be such, as to make it highly improbable that any ball, in its excursion under shock, can reach the upper end. A wood stop is fixed at this point to arrest the ball, should it ever chance to reach it; and beyond this a stout net (like the purse of a billiard-table) may be fixed to a separate support (from the floor), to receive the ball, if upon an extraordinary occasion thrown out of the instrument.

It is assumed that any alternate alteration of the inclination, of the inclined planes  $i, i$ , by actual *surface-undulation*, carrying the whole instrument with it at the passage of the earth-wave, may be neglected, *i.e.* that, for example, a wave passing in a direction from S. to N. will not sensibly lift up the S. end (of the N. S. instrument) first, and then the N. end, and so first increase the inclination of the plane of  $B_2$  and reduce that of  $B_1$ , and then *vice versa*; and that whatever amount of *tilting* may thus occur will so *momentarily* affect the inclined planes, and in opposite directions, as not to interfere with the proposed movements of the balls.

This assumption is justified by the fact that the value of  $\lambda$ , the amplitude of the earth-wave in the normal, is always great in relation to its altitude, and in the case of oblique surface-emergence its horizontal component is of still greater length; so that the angle of slope of either face of the emergent wave with the horizon, is practically imperceptible in moderate shocks; and, further, any tilting that can occur takes place in opposite directions successively, so as nearly to compensate.

The vertical spring  $e$  must be delicate and sensitive, at the first instant of its compression, in proportion to the movement by inertia of the large mass that it carries, and its range, proportioned to the degree of steepness of emergence to be expected in the region of observation.

The whole vertical component is absorbed by this spring, and may be measured by its compression; but it is important that it shall give way sensitively, at the first moment of shock, in order that neither of the balls shall have any tendency to rise from the inclined planes that support them, and that its resilience shall not be too lively, so as not to produce rebound upon the restoration from compression. In certain seismic regions, where great steepness of emergence may be looked for, the vertical component will probably be best met by the depression of a conical float with the apex downward, fixed to the lower end of the bar  $b b$ , into a cylindrical vessel of water placed beneath the instrument; but this must be matter of experiment in such regions.

Were the whole instrument rigidly fixed to the ground, the latter as well as the materials of the instrument and ball highly elastic, and the velocity of emergence of the wave, in its vertical component, very great, it is obvious that time would not be afforded to the ball  $B$ , merely to *roll* up along the plane; it would be *thrown up* obliquely from it, and, describing a short trajectory, would fall back again upon the plane a little higher up, and then repeat a still shorter trajectory, or begin to roll upwards. But the ball is very inelastic, the rate of emergence of the wave is not very great in its vertical component; and the effect of this upon the instrument is spread over a still longer time by the interposition of the spring  $e$ .

If  $t$  = the time of the wave in seconds,  $\frac{t}{2}$  will be nearly the instant of its maximum velocity  $v$ , in feet per second; thus the condition that shall ensure the ball  $B$  *rolling only*, and not being projected, is that the vertical component of  $v$  shall be less than

$$v = 32 \frac{t}{2}.$$

Unless, possibly, in the case of nearly vertical emergence, and from the most solid, and elastic crystalline rock, an ample latitude,  $\epsilon$ , is secured by the vertical spring.

We will now consider the movements of the element balls B and B<sub>1</sub> along the planes  $i, i$ , due to the horizontal component of motion, taking the two instruments (viz. the N. S. and E. W. seismometers) together, and assuming the horizontal component in any azimuth  $\theta$ .

The blocks  $gr$  (N. S.) and  $gr$  (E. W.) move forward horizontally, and force on the balls B and B<sub>1</sub> before them until the instant,  $\frac{t}{2}$ , when the blocks have acquired their maximum velocities, with that of the wave,  $v$ ; the balls then part company from the blocks, and continue to move up along the respective inclined planes  $i, i$ , *sliding* for the first indefinitely short moment, and then, with a certain reduction of velocity due to the friction of the planes which produce the change of motion, *rolling* up along them. This initial sliding velocity will be

For the ball B . . .  $V = v \sin \theta$ ;

For the ball B<sub>1</sub> . . .  $V = v \cos \theta$ .

As soon as the sliding is converted into rolling motion by friction, these velocities will become

$$\frac{5}{7} v \sin \theta, \text{ and } \frac{5}{7} v \cos \theta.$$

Assuming that the change takes place almost instantly after the balls have begun to move from the blocks, *i. e.* that gravity has not had time perceptibly to alter the velocity up the plane, and neglecting the small effects, due to the elastic compression of the balls and blocks themselves, and also supposing that the *loss* of velocity of the ball, by conversion of its sliding into rolling motion by friction, is less than the diminution of velocity of the block (in the same short time), in returning from its maximum velocity to rest, the balls B and B<sub>1</sub> will be retarded by forces—

$$\text{For B. . . . . } \frac{5}{7} g \sin i,$$

$$\text{For B}_1 \text{ . . . . . } \frac{5}{7} g \cos i,$$

$i$  being the common inclination of the planes.

The ball B will therefore ascend upon its plane to a vertical height

$$\frac{\left(\frac{5}{7} v \sin \theta\right)^2}{\frac{10}{7} g} = \frac{5}{14} \frac{v^2}{g} \sin \theta = H;$$

we have therefore

$$v \sin \theta = \sqrt{\frac{14}{5} g H}.$$

So also the ball B<sub>1</sub> will ascend to the height

$$v \cos \theta = \sqrt{\frac{14}{5} g H'};$$

therefore

$$\tan \theta = \sqrt{\frac{H}{H'}},$$

and

$$V = \sqrt{\frac{14}{5}g(H-H')},$$

or, if  $g=32$ ,

$$V = \sqrt{\frac{448}{5}(H-H')} = \sqrt{89.6(H-H')}.$$

This calculation assumes that the sliding is converted into rolling motion in an indefinitely short time, as it would in fact be, if the adhesion of the balls were large, and the inclination of the planes  $i$  small; but if the inclination of the latter be considerable, as  $15^\circ$  or upwards, a more exact determination is necessary.

Let, as before, the horizontal components of the velocity with which the balls begin to move, be  $v \sin \theta$ , and  $v \cos \theta$ ,  $Z$  the velocity in the vertical, and the inclination of the planes  $i$  now large.

The initial velocity of ascent parallel to the planes will be,

$$\text{For the ball B} \dots \dots v \sin \theta \cos i + Z \sin i,$$

and

$$\text{For the ball B}_1 \dots \dots v \cos \theta \cos i + Z \sin i.$$

Let  $\phi$  be the coefficient of frictional adhesion, of the balls to the plane; then they will ascend the planes to the heights,

$$B \dots H = \frac{(v \sin \theta \cos i + Z \sin i)^2}{2g} \cdot \frac{2 \tan i + 5\phi}{2 \tan i + 7\phi},$$

$$B_1 \dots H_1 = \frac{(v \cos \theta \cos i + Z \sin i)^2}{2g} \cdot \frac{2 \tan i + 5\phi}{2 \tan i + 7\phi}.$$

$v$  and  $\theta$  are known if the value of  $Z$  be given; and this may be ascertained experimentally from the compression of the vertical spring; or, as suggested by my friend Dr. Harte, to whom I have been indebted for these equations, a second pair of experimental inclined planes and balls might be used, with an inclination greater than  $i$  (say  $2i$ ), from the observed movements upon which, two more equations could be got, the four equations being then more than enough, to determine  $v$ ,  $Z$  and  $\theta$ .

But the nature of the instrument is to record the values of  $H$  and  $H_1$ , *in terms of the whole time* that the balls  $B$  and  $B_1$  are *out* of contact with the block  $gr$ , *i. e.* of their rolling up, and down, the inclined planes,—this time being given, by the lacune in the pencil-trace made upon the revolving cylinder of paper carried along by the clock. The time of the balls' ascending to the highest point reached on the plane will be independent of adhesion; and calling it  $t$ , we have,

$$\text{For the ball B} \dots \dots t = \frac{v \sin \theta \cos i + Z \sin i}{g \sin i};$$

$$\text{For the ball B}_1 \dots \dots t_1 = \frac{v \cos \theta \cos i + Z \sin i}{g \sin i}.$$

The time of descent back to the starting-point, due to the heights  $H$  and  $H_1$ , will be a little, but inappreciably, less than this.

The entire time of the double oscillation of each ball, therefore, or its movement up and down the plane, as recorded by the instrument, is,

$$\text{For B} \dots T = \frac{v \sin \theta \cos i + Z \sin i}{g \sin i} \left( 1 + \sqrt{\frac{2 \tan i + 5\phi}{2 \tan i + 7\phi}} \right);$$

and

$$\text{For B}_1 \dots T_1 = \frac{v \cos \theta \cos i + Z \sin i}{g \sin i} \left( 1 + \sqrt{\frac{2 \tan i + 5\phi}{2 \tan i + 7\phi}} \right),$$

the coefficient  $\phi$  being always  $= \tan \alpha$ , the angle of sliding for the surface-material of the balls upon that of the inclined planes.

Reverting now to the time balls  $B_1$ ,  $B^2$ , those which, *being left behind*, record the instant of the arrival of the shock at the instrument,—it has been stated that we have no occasion to determine their subsequent movements; it may be well, however, to clear our notions generally as to what these will be. Rotation is almost instantly communicated to these balls by adhesion with the moving planes on which they rest. The block moves off horizontally (in the direction of the wave) from the ball, which rolls thus with a retarded motion up the inclined plane in a relatively opposite direction. The block attains its maximum velocity  $V$ , and, coming to rest, reverses the direction of its own motion, and now follows back after the ball that it had left behind, which it *may* overtake, and *strike*, with a relative velocity equal to the sum of its own velocity and that of the ball, or to their difference, dependent upon the state of motion of the ball at the moment of impact. The impact calling forth elastic force from ball and block, the former will be thrown up along the inclined plane; but the extent of this movement, or whether it occur at all, will depend upon the dimensions and velocity of the wave itself (resolved into the line of movement on the inclined plane) and upon the elasticity, &c. of the ball and block. These we have no occasion to pursue further: the *actual* movements of these balls,  $B_1$  and  $B^2$ , however, will be found recorded in time also, by their own pencil-tracers on the cylinder; but the only indication that concerns us, is the first instant of broken contact, as already explained.

A *single* seismometric observatory, such as has been now described, set up within a given region of disturbance, is capable of giving the elements, necessary for the calculation of the position of the seismic focus, but without the power of controlling the accuracy of the results, except in so far as coincident repetitions may confirm or refute them. But if *three such* seismometric observatories be set up within the region chosen, in positions that shall form the angles of a triangle with respect to each other, at moderate distances apart (from 15 to 30 miles), and these be all connected by galvanic wires, so that the whole of their records shall be made upon a single paper cylinder, moved by a single clock in one of the three observatories, we then have a further control, and an independent method of obtaining, both the horizontal component of direction, and the surface-velocity, from which, by methods yet to be stated, the depth of origin may be calculated without direct ascertainment of the vertical component in  $Z$ . The cylinder must in this case carry twelve pencil-tracers, four leading from each observatory.

This leads us to the second and somewhat simpler form of seismometer proposed by me, and shown in figs. 4, 5, 6 and 7 (of Plate XV.). In some respects, the principles of this instrument are the same as of that just described: like the former, it is a double instrument, each instrument having two moveable balls; but their action is different. Fig. 4 represents, in elevation, one of these instruments (let us suppose, that N. S.) as seen looking eastward, and the upper part of which is seen in plan in fig. 5.  $ss$  is the floor of the observatory within which the two similar instruments are placed.  $tt$  is a shallow and flat-bottomed dish or basin of some feet in diameter, and about nine inches in depth, formed by a circular wooden curb or rim secured to the floor.

In the centre of this, there stands up vertically a very stiff pillar or upright, rigidly secured into the floor, and which may be either of hard stone, hollow cast iron, or of hard wood, but best of the second. Its upper end is formed of wrought or cast iron in the form shown; and into it are secured the vertical supports of hard wood,  $s, s$ , which are placed with their parallel and vertical axes in the plane of the meridian or at right angles thereto, and are prepared,

so as to support the balls B and B<sub>2</sub> upon their upper ends, which are *slightly* hollowed to the same curve as the surface of the balls, as seen at full size in fig. 7. The balls, when in this position, rest against and are steadied by the hollow stop over the axis of the vertical pillar, *b* in figs. 4, 5, and 6.

The balls may be common cast-iron cannon shot, chosen of good spherical form and of equal weight; and each ball is in metallic connexion at one point of its surface with a galvanic-circuit wire, of which it forms one pole, marked *et*,—the supports *s*, *s*, and the stop *b*, being all of hard wood or other insulating material, as pottery or glass. The height of the central column should be such, that the centre of gravity of each of the two balls, when on their supports, may be some submultiple of 32 ft. =  $g$  (say 8 feet =  $\frac{1}{4}g$ ), for facility of calculation.

The shallow basin *tt* is subdivided in two semi-circular separate areas, by a wood division, *d*, equal in depth to the outer rim, this division crossing in the diameter which lies at right angles to the plane of the supports *s*, *s*,—*i. e.* being east and west for the north and south balls, and *vice versa* in the other instrument. Each segment of the shallow basin is lined within its outer rim and bottom with sheet-lead, which is at one point of each in metallic contact with the other pole of the galvanic circuit marked *E<sub>2</sub>*—.

The two segments of the dish are filled up to the level of the surrounding rim, with a bed of damp sand, pressed uniformly and “struck off” level to the rim by a straight edge, so as thus to present a uniform bed 9 inches deep, the balls B, B<sub>2</sub> being 6 inches in diameter and 8 feet above it. While the instruments (*i. e.* that N.S. and E.W.) are thus prepared, the galvanic circuit remains constantly *broken*, the poles formed by the balls being insulated from the other poles formed by the sand-beds, the lead lining, &c. Suppose now, in fig. 4, an earthquake-wave to emerge from S. to N. in the direction of the arrow; the ball B<sub>2</sub> is *left behind* as in the former instrument, topples off its slender support *s*, and commences to fall to the surface of the sand. The moment it strikes the sand, it makes contact with its own circuit, and as the time of its fall can be exactly calculated and is constant (neglecting the small resistance of the air), this ball (as before) marks the precise moment of the arrival of the shock at the instrument. The other ball B is urged forward by the movement of the whole instrument in the direction of the arrow, or that of the wave’s emergence, being supported by *s* and *b*, until the instrument acquires its maximum velocity *v* as before. This ball is then thrown off from its support with this velocity, and, describing a small trajectory in air, falls to the bed of sand, and in its turn makes contact with its own galvanic circuit. The ball partially buries itself in the damp sand at the spot it falls upon, without change of position from any elastic effort, all such being absorbed by the “deadness” of the sand. If the shock has been in the plane of the meridian, the place where it shall land on the sand-bed will also be in that plane, say at B’.

Then the horizontal distance from the centre of its support *s* to the centre of the ball, measures the horizontal component of the velocity, this space being described by it during the time of its descent through eight feet. The difference in time (as shown upon the ruled paper by the pencil-tracers and clockwork as before) between the instant of B<sub>2</sub> and of B leaving their supports, is almost exactly =  $\frac{t}{2}$ , or half the time of the wave.

The same explanations will apply to the other, or E. and W. instrument; and if the azimuth of emergence  $\theta$  be somewhere between N. S. and E. W., all four balls will be displaced, and the *obliquity of throw* of each of the balls



**B (N. and S.) and B (E. and W.)** from their respective cardinal and vertical planes, will indicate the actual azimuth of the horizontal component of the earthquake wave—giving this indication in two ways, each controlling the other,—viz. by direction of throw as stated, and by distance of horizontal traject, which will be proportionate to sine and cosine  $\theta$ .

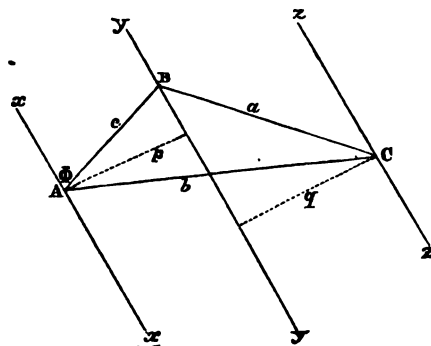
The stop *b*, it should be remarked, is hollowed at contact with each ball, so as to embrace 90° of its horizontal great circle; so that in case  $\theta = 45^\circ$  from the meridional or the E. and W. planes, the balls cannot slip aside, but must be thrown in the same direction, the extreme angles of the stop then passing through the plane of motion and centre of gravity of the balls.

Figs. 5 and 6 show in plan the relative positions of the N. S. and E. W. instruments, the upper portions alone being represented, and not at the necessary distance apart.

These instruments singly, then, give us the velocity of the wave and its direction in azimuth with considerable accuracy; but their full value would only be ensured by placing three such seismometers within a given district (as already stated for the former instrument) and connecting them all by galvanic wires, so that the indications of the three shall be recorded by a single clock register. We then have the *time of arrival* of the shock at each seismometer given with perfect accuracy, from which both its horizontal velocity and azimuth may be computed; and the relative positions and distances apart of the several seismometers being known, the true direction of emergence of the wave, and the point of the surface vertically over the origin, and the depth of the focus itself may be computed. The two following methods of computing these are due to Professor Haughton, of Trinity College, Dublin, who communicated them to the Geological Section of the British Association at Dublin, on the occasion of this report being read, and from whom I have received them for publication here.

The determination of the "coseismal line"—a term first used by me at the suggestion of Sir John Herschel, to signify, the crest of the simultaneously emergent earth-wave upon the earth's surface at any moment of its progress—is the same thing as determining the direction of its motion on the surface, a horizontal tangent to the coseismal line at any point being always orthogonal to the direction of motion.

*Given the Times of an Earthquake Shock at three places, to determine its Horizontal Velocity and Coseismal Line.*



Let A, B, C, denote three stations at which the time of arrival of the earthquake shock is determined by the seismometers or other means, and let

$a, b, c$ , denote the distances between them; let  $v$  denote the unknown horizontal velocity; and let  $\Phi$  denote the unknown angle made by the coseismal lines  $x A x, y B y$ , with the line  $A B$  joining the first two stations; and  $t_1, t_2, t_3$  be the times of the observed shock at  $A, B, C$ , respectively.

Letting fall the perpendiculars  $p$  and  $q$ , we find,

$$v = \frac{p}{t_2 - t_1} = \frac{c \sin \Phi}{t_2 - t_1} \quad \dots \quad (1)$$

$$v = \frac{q}{t_3 - t_2} = \frac{a \sin (B - \Phi)}{t_3 - t_2} \quad \dots \quad (2)$$

Equating these two values of  $v$ , we find

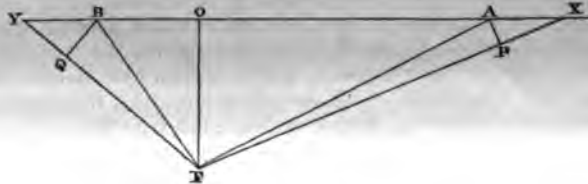
$$c(t_3 - t_2) \sin \Phi = a(t_2 - t_1) \sin (B - \Phi).$$

Expanding, and solving for  $\tan \Phi$ , we finally obtain

$$\tan \Phi = \frac{a(t_2 - t_1) \sin B}{c(t_3 - t_2) + a(t_2 - t_1) \cos B} \quad \dots \quad (3)$$

Having found  $\Phi$  by means of this equation, we can then determine  $v$  from either (1) or (2).

*Given the Horizontal Velocity of an Earthquake at any two points, and its absolute velocity; to find the position of the focus from which it has proceeded.*



Let  $A$  and  $B$  be the points under consideration, and for simplicity suppose them to lie at opposite sides of the unknown focus  $F$ , and in the same vertical plane passing through  $F$ . [These suppositions are only made to simplify the figure, but do not in any way diminish the generality of the result.]

Let  $AX$  be the space moved through on the surface of the ground at  $A$  in the unit of time, and equal  $v$  the horizontal velocity, and let  $BY$  be the velocity at  $B$  and equal  $v'$ . Letting fall the perpendiculars  $AP$  and  $BQ$ ;  $PX$  and  $QY$  will denote the spaces described by the earthquake in a *radial* direction ( $FX$  or  $FY$ ); they are therefore equal and each is the *absolute* velocity of the earthquake  $= V$ . Hence

$$\cos AXF = \frac{V}{v} \quad \dots \quad (1)$$

$$\cos BYF = \frac{V}{v'} \quad \dots \quad (2)$$

Therefore since  $v, v', V$  are all known quantities, the angles  $AXF$  and  $BYF$  are also known, and therefore the lines  $XF$  and  $YF$  may be drawn, and their intersection  $F$  will give the required position of the focus.

Corol. 1. If the position of the point  $O$ , at the surface, from which the earthquake appears to radiate, be known; one velocity will determine the depth of the focus.

Corol. 2. Independently of any diminution in the *absolute* velocity of the earth-wave, the apparent horizontal velocity will diminish rapidly, approaching indefinitely the limit  $V$ . This is evident from the geometrical considerations arising from the fact that  $PX$  is always equal to  $QY$ .

It is obvious, then, that by the establishment of these very simple and inexpensive seismometers, and connecting them galvanically (as respects their registration) by methods now become both familiar and simple, we may get good first approximations to one of the most important questions of the physics of our globe—a knowledge of the depth from which earthquake impulses arrive.

Simple and inexpensive, however, as the apparatus recommended is, its establishment in the only way in which it can be of much real use, namely by connected distant stations, involves the choice of seismic areas fitted for the purpose, and the support and aid of governments, if not for outfit, at least for appointment of observers, and police protection of stations and wires. It is to be hoped that even these may not be withheld as the advancing knowledge of the importance to physical geology of seismic research becomes better understood and diffused. Meanwhile a still simpler form of rough seismometer, suited to the resources of distant and isolated observers, may be with advantage, perhaps, pointed out,—and also an indirect method, by which the depth of earthquake origin may be approximated, without the use of seismometers of any sort. The form of seismometer about to be described is most applicable to seismic districts where the angle of wave-emergence is not steep, *i. e.* where the shocks are usually nearly horizontal.

If any homogeneous, parallelepiped, or rectangular prism, standing on end, upon a level surface, be upset by its own inertia, the supporting surface being suddenly moved beneath it, in the direction of its own plane (as by the horizontal component of an earthquake shock), it may be shown that the velocity of the surface must be

$$V^2 = \frac{4}{3}g\sqrt{a^2 + b^2} \times \left( \frac{1 - \cos \theta}{\cos^2 \theta} \right)$$

where  $a$  is the altitude of the solid,  $b$  its diameter of base, and  $\theta$  the angle formed by the side and a line drawn through the centre of gravity to the extremity of the base, and  $V^2 = 2gh$ .

This velocity is independent of the density or material of the *solid*, because the oversetting force, being its own inertia, is always proportionate to the density. With a given velocity  $V$ , therefore, it is possible to assign the dimensions  $a$  and  $b$  such, that it shall be *just upset*; and with this velocity another solid, having  $\theta$  greater, shall remain unmoved,—assuming always that friction upon the supporting surface gives sufficient adhesion to cause the solid to upset, and not to slide (partly or wholly) without upsetting.

If in place of a square prism like a wall, the solid be a right cylinder, such as a pillar, the diameter of whose base, as before, is  $b$ ; then

$$V^2 = \frac{15b^2 + 16a^2}{12a^2} \times g\sqrt{a^2 + b^2}(1 - \cos \theta);$$

and from this very simple expression for the horizontal velocity, for which I am indebted to my friend Professor Haughton, it is easy to construct a seismometer of the greatest simplicity, that (in the absence of better means) shall give, within a narrow limit, the actual velocity of shock.

Let there be constructed two similar sets of right cylinders, say each set, six to twelve in number, all of equal height ( $a$ ) and of the same sort of material, but varying in diameter in each set, with a uniform decrement from the greatest to the least.

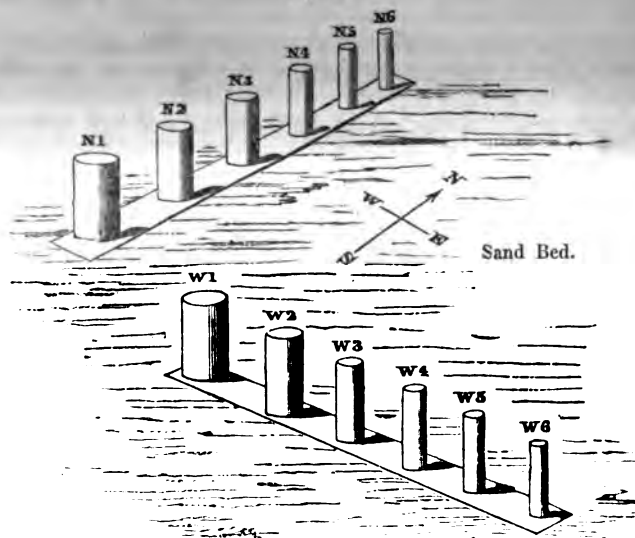
Convenient dimensions for earthquake observations of *mean* intensity, will be such, that the cylinder of largest diameter shall have its altitude equal to three diameters, or  $b = \frac{a}{3}$ , and that the cylinder of least diameter shall have

its diameter one-third of that of the greatest one, or  $b = \frac{a}{9}$ . Any number of cylinders of intermediate diameters may be interpolated between; and the greater the number, the more accurate the instrument becomes. A series of six to ten in each set will, however, be sufficient for any purpose. For observation of shocks of extreme violence, larger diameters, in proportion to altitude, should be chosen for all the cylinders.

The material of the cylinders is not important, cast iron, stone, pottery, or other substances at hand, whose *arrises* will not crumble away by being overthrown, may be used; but no material will be found more convenient than some hard heavy wood, of uniform substance, straight grain, and equable specific gravity, from which the cylinders can be formed in the lathe, and their bases brought perfectly square to the axis with facility.

Upon any horizontal and solid floor let two planks be placed, as in fig. 6, with their directions in length respectively lying N. and S. and E. and W.,

Fig. 6.



each plank to be about 3 inches in thickness, and in width equal to the diameter of the largest cylinder, and its length such that the set of cylinders, when placed upright and equidistant thereon, shall have a space greater than the altitude between each. Thus, if the cylinder of largest diameter have  $b = 0.5$  of a foot, the length of plank will, for a set of six, as in the figure, be about 12 feet. These base-planks being *fixed*, level, and solid, the floor is to be levelled up to their upper surfaces with dry sand, and the two sets of

cylinders adjusted to their places, one set running in an east and west, and the other in a north and south direction, so that in whatever direction the horizontal component of shock may move, the overthrown cylinders, of one or the other set, shall fall transversely to the lengths of either of the plank bases, and, lodging on the sand-bed, *remain exactly in the position as to azimuth in which they were overthrown.* If now a shock of any horizontal velocity capable of overthrowing some of the cylinders, but not all of them, arrive, it will throw down at once all the narrower ones, and up to a certain diameter of base. For example, suppose a N. and S. shock, of such velocity as to overthrow W 6, W 5, and W 4, leaving W 3, W 2, and W 1 standing; then V will have been *greater* than the velocity due to the overthrow of W 4, and *less* than that due to the overthrow of W 3, and, within those limits, may be found from the preceding equation. The cylinders here overthrown, W 6, W 5, and W 4, will be found with their axes lying N. and S., at rest upon the sand-bed. The cylinders N 6, N 5, and N 4, will be also overthrown; but in this case they will fall in the line of their own plank bases, and *may* roll and so give no indication as to direction of shock in azimuth. Hence the necessity for two sets of cylinders; one set, however, will be sufficient, if space enough be provided between the cylinders, and if each be placed upon a cylindrical and separate basis of a diameter equal to its own, and in height equal to the depth of the sand-bed.

This form of instrument, then, is capable of giving approximate determinations of—

1st. The velocity of the horizontal component of shock, neglecting the vertical component, which may be done where the angle of emergence is not great.

2nd. The azimuthal direction of the horizontal element of shock.

3rd. Its absolute direction of primary movement, viz. the direction of translation of the wave, which always coincides with the direction of molecular movement of the elastic wave itself, in the first half of its complete phase: *e. g.*, if the wave show a N. S. azimuth, by the line of direction of axes of the overthrown cylinders, and these be thrown to the northward, then the wave has traversed from S. to N.

4th. The exact time of the transit of shock may be also indicated if the narrowest cylinders, N 6 and W 6 be connected with a clock, so as to stop it at the moment of overthrow by the very simple means which I have pointed out in the 'Admiralty Manual' (art. "Earthquake," sec. vii., p. 208, 2nd edit.), inasmuch as, by hypothesis, the narrowest cylinders will be *always* overthrown.

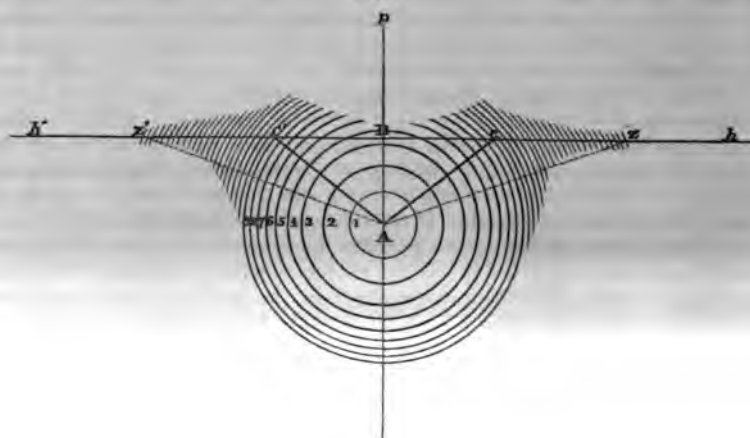
A single cylinder or prism, however entirely distinct from either seismometrical set, and of even less stability as respects shock, may be with advantage adopted as the means for stopping the clock by the above method, which is capable of giving the time to within 0.1 of a second.

It is obvious that the application of the principles involved in this form of seismometer to observations made upon the recent overthrow of walls, columns, or other such objects to be found in regions which may have been visited by earthquakes, is capable of giving also approximate measures of velocity and direction of shock. This class of seismic observation will, I hope, be found more fully developed elsewhere.

In conclusion, one other method of indirect seismometry remains to be explained, which does not require the aid of any seismometric instrument. The facts upon which this method depends have been alluded to in the Report on Earthquakes of 1850, p. 35. It has been long observed that, in *extensive* surfaces of country that have been exposed to the effects of shock,

certain zones or areas of surface, more or less irregular, present themselves, within which the destructive effects upon buildings and other objects capable of overthrow are manifested much more intensely, than upon similar objects situated upon other portions of the superficies of the country. These zones of maximum disturbance (as yet ill observed) have been remarked to run in curvilinear directions of surface, to approach more or less, according to the means of (*i. e.* the objects afforded for) observation, to closed curves, and to be wholly distinct from those variations of destructive agency, irregularly *parsemé* over large shaken areas, which depend upon differences of geologic surface-formation, configuration of country, &c., construction of buildings, and many other conditions, which modify the direction and effects of the shock at points often very little removed from each other, and the analysis of which, and extrication of the true primary movement from the entanglement of such minor phenomena, constitute the greatest difficulty of earthquake observation. The physical conditions which give rise to such zones of maximum disturbance are easily explained.

Fig. 7.



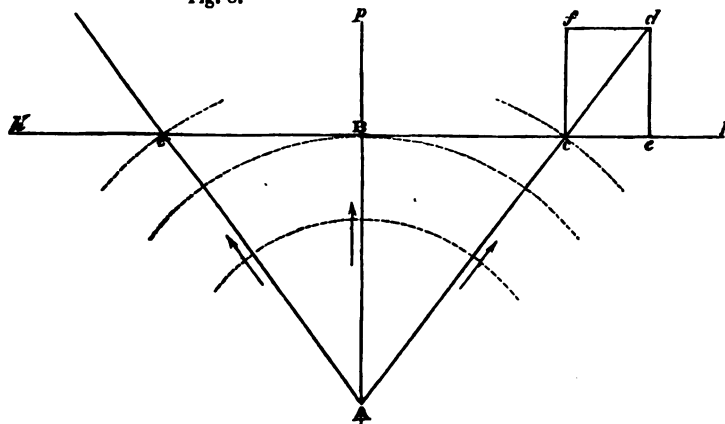
Referring to fig. 7, let  $h'h$  be the horizon (which we may assume a right line) cut by a vertical plane passing through a great circle of the earth, and through A, the centre of impulse of the earthquake. The blow from this origin is propagated outwards in all directions, through the elastic mass of the earth (here assumed homogeneous), in spherical concentric shells, which the circles 1, 2, 3, 4, &c. denote, at similar phases of the wave. The elastic wave starts from the impulse with one normal and two transversal vibrations. Its *vis viva* must remain constant, and (in the same medium its dimensions being very great) the velocity of translation also. The mass in wave-movement, at any moment of its transit, is therefore the same, and the thickness of each successive spherical shell decreases from the centre of impulse as the square of its mean distance. This is the measure of the normal excursion of any particle, from any given phase of the wave, in its passage outwards, to the recurrence of the same phase, and is also the measure of the normal intensity of the shock, or that in directions AB, AC, AZ, &c. Neglecting for the present the effects of the transversal wave, the normal intensity or *direct* overthrowing power of an earthquake shock varies inversely as the square of the distance from origin. But the *surface* capability of the shock

to overthrow buildings, &c. depends not only upon its intensity, but upon the direction of its movement with respect to the horizon. A shock perfectly vertical has no tendency to overturn the *walls* of a house, though it may bring down the roof or floors. Now it is obvious from the figure, that as the wave passes outwards from the origin, A, it reaches the earth's surface vertically at B, the point in the prime vertical,  $pA$ , directly over the same; and that as it travels outwards, it emerges at the surface with angles more and more nearly horizontal; the angle of emergence being the same at all points of any coseismal line, all such lines being, on the assumption of homogeneity, concentric circles round B (like those upon a pond into which a stone has been thrown).

So far as the *direction* of wave motion is concerned, therefore, its power to overturn buildings is greater the further it has travelled, or the greater the radius of the coseismal circle from B; but its *energy* has been shown to be inversely as the square of the distance (not upon the earth's surface, but in the normal). Hence it follows that there must be some given distance upon the surface around B at which the combined effect, of most advantageous direction and lessened energy, shall produce the most destructive effects upon buildings, &c., or a point, C, intermediate to B and Z, or Z' supposed at any indefinite distance, at which the shock will be, in this respect, a maximum. The radius BC will then describe a coseismal circle upon the earth's surface, which will be a zone of maximum disturbance.

Conversely, if we can trace by observation of the shaken country such a zone, or ascertain three points in its circle, we can find the centre of the circle or the point B, which is plumb over the centre of impulse beneath; and if we have ascertained the angle of emergence that produces the maximum effect (and which is a constant), we can then calculate the depth of the centre of impulse, A, beneath the earth's surface.

Fig. 8.



Referring to fig. 8, let A be, as before, the centre of impulse; B the point upon the earth's surface (supposed a plane), in the prime vertical  $pA$ , directly above it. It is required to find a point, C, at which the horizontal overthrowing effects of an impulse in the direction AC, whose intensity varies inversely as the square of the distance, shall be a maximum.

Produce AC to  $d$ , and complete the parallelogram of forces,  $f d$  being parallel to the horizon.

Let  $BA=a$ , the depth of origin ;  
 $BC=r$ , the radius where the horizontal force is a maximum ;  
 $AC$ =the normal due to this radius.  
 The angle  $Cde=BAC=\theta$ .

Then the force at C in the direction AC is  $\frac{1}{a^2+r^2}$ ; and that in the direction of the horizon is  $\sin \theta \times \frac{1}{a^2+r^2}$ ; and as

$$\sin \theta = \frac{r}{\sqrt{a^2+r^2}}$$

we have  $\sqrt{a^2+r^2} : r :: 1 : \frac{r}{\sqrt{a^2+r^2}}$

and  $\frac{1}{a^2+r^2} \times \frac{r}{\sqrt{a^2+r^2}} = \frac{r}{(a^2+r^2)^{\frac{3}{2}}}$  a maximum.

Differentiating,  $(a^2+r^2)^{\frac{3}{2}} \times dr - \frac{3}{2}(a^2+r^2)^{\frac{1}{2}} \times 2r^2 = 0$ .

$$a^2+r^2=3r^2$$

$$r = \frac{a}{\sqrt{2}} = \frac{a\sqrt{2}}{2}.$$

The angle  $CAC'$  is therefore very nearly  $70^\circ 31' 43''$ , which is the angle of the cone whose base in the horizontal plane limits the zone of maximum disturbance; and as the angles at B are right, the angle of emergence  $BCA=54^\circ 44' 9''$ , and the sides of the triangle,  $BC : BA : AC$ , are to each other in the ratios of

$$1 : \sqrt{2} : \sqrt{3}.$$

Hence we arrive at the very simple practical rule.

Having found the coseismal zone of maximum disturbance by observation, or three points in it, and the centre of the circle passing through them, the depth below the surface, of the origin or centre of impulse, will be the diagonal of the square whose side is equal to the radius of the given circle.

Within certain approximate limits, then, the application of this rule is capable of giving some information upon that great object of research, to which, above all others, seismological investigation points, namely, the depth beneath our surface from which such impulses reach us, and, by consequence, that at which active volcanic forces are in operation within our planet.

This method can scarcely be applied in very mountainous regions, unless both mountain-formations and seismic energy be developed upon a grand scale, as in Mexico and South America; and in every case the observer will find himself encumbered and perplexed by the interference of many minor circumstances of disturbance to mask and render difficult his observations. These, however, should not prevent our bearing the method in mind whenever favourable conditions present themselves for its use.

In the present state of the theory of wave-movements in elastic solids, it cannot be said to be experimentally certain, that the energy of the wave, in the normal, does diminish with the square of the distance. Another view of the primary conditions of its motion would make it diminish directly as the distance, in which case it may be proved that the angle  $CAC'$  of the coseismal cone of maximum disturbance will be  $90^\circ$  and constant, and hence



that the depth of the origin (upon that hypothesis) will be always equal to the radius of the circle of maximum disturbance. It would be out of place here to enter further into the physical discussion of this question, except by referring to Herschel (art. "Light," 'Encyc. Metrop.' vol. iv. paragr. 18. p. 578) and to the various papers of Cauchy, Wertheim, Stokes, Airy, Haughton, and Maxwell on the subject.

I have stated that in the preceding investigation the effects of the transversal wave are neglected. In the observation of actual earthquake phenomena, this may probably be safely done as respects all points that are at considerable distances from the centre of disturbance. The normal and transversal waves, starting at the same instant, appear to travel with unequal velocities. They part company; and their distance becomes greater, and the interval larger between their arrivals, the further they have both travelled. Were we enabled, therefore, to ascertain the precise velocity of the normal wave, and the exact interval of time between the arrival at a distant point of the normal and transversal waves, we could still by another method arrive at the distance from which they had come, and therefore at the depth of the origin of impulse, if the angle of emergence at one point were known. According to Cauchy, the velocity of transit of the normal is to that of the transversal wave as  $\sqrt{3} : 1$  in media of unlimited mass; and Wertheim's modified formulæ for elastic bodies fix it as  $2 : 1$ . My own experimental observations with the seismoscope have proved to me that the separation of the two waves can be noticed, and the interval of time measured upon even very moderate ranges of wave-transit, not exceeding a few miles; and the observations of earthquake shocks indicate that *one cause* of the tremors that usually *succeed* the main blow, is the later arrival of the normal wave, whose amplitude at considerable distances from the origin is always small.

However this may be, it is certain that in all earthquakes the real mischief and overthrow, at places pretty far removed from above the centre of impulse, are done by the blow from the normal wave, which appears to come first; hence the main observable effects are those of the normal, and we are justified and enabled, *in such localities*, to neglect the transversal. But within a considerable circle of area, whose boundary is evanescent, and whose centre lies at the point B (figs. 7, 8), right above the origin, the actual effects of the transversal wave are very formidable, and can never be neglected.

The ground beneath an object so situated, such as a house or pillar (as the distance from the origin to the surface is the minimum range of emergence, or shortest possible, and therefore its energy the greatest), is almost at the same instant thrown nearly vertically upwards by the normal wave, and at the same moment rapidly forced forwards and backwards horizontally in two directions orthogonal to each other; and this combined movement, which is that called "vorticoso" by the Italians and Spanish Mexicans, is one that nothing, however solid and substantial in masonry, &c., can long withstand.

Hence it follows that, within the zone of maximum disturbance which we have treated of, and occupying its central region, we shall always find an area, more or less circular, also of great overthrow and destruction, though presenting entirely different characteristics as to the manner of overthrow of the buildings, &c. This middle region may therefore be sought for as a further directrix to the point B over the centre of impulse. It may be necessary to remark that this combined movement, due to the two transversal waves, and *limited* to a region closely above the prime vertical passing through the centre of impulse, must not be confounded by any misconception

tion of the phrase "vorticoso," with that false notion of vorticose shock, such as was presumed to have twisted the Calabrian obelisks, &c., the real nature of whose displacement I indicated in 1846. (Trans. Roy. I. Acad. vol. xxi. part 1. See also 1st Report Trans. Brit. Assoc. 1850, pp. 33, 34.)

In conclusion, I would repeat my conviction that a further expenditure of labour in earthquake catalogues of the character hitherto compiled, and alone possible from the data to have been compiled, is now a waste of scientific time and labour. The main work presented for seismologists in the immediate future, must consist in good observations, with seismometers advantageously placed at sufficiently distant stations, and galvanically connected as to time; and in the careful observation of the traces left by great shocks (when of recent occurrence) upon buildings and other objects artificial and natural, with a view to determining the nature of the forces that have affected them, aided by the resources of the physicist and mathematician.

Amongst the unknown regions of our world, as respects the recurrence of earthquakes and their phenomena, the most prominent are Central Africa, Abyssinia, Madagascar, Northern Asia, and the north-west of North America. For observations of the last, the new settlements about being formed at Vancouver's Island will, no doubt, offer great facilities, as well as future access to the great Aleutian chain of volcanoes and their seismic zone.

I reserve for the Appendix a few observations, upon great sea waves and certain ill-understood phenomena, which could not systematically find place in this Report.

## APPENDIX.

### No. I.

(P. 48.) The following table of some of the men and events upon which the progress of human knowledge and discovery and the diffusion of mankind have depended, may serve to illustrate the relations that these bear to the expanding character of the catalogue:—

	Date. A.C.
Yards for spreading ships' sails invented .....	1200
Silver money.—Anchors.—First sea fight.....	700
Amber and tin carried by Phœnicians from the Baltic and England to the Levant..	600
The sounding-line used <del>at</del> sea.—Maps in use.—Multiplication table.—Moon's eclipses calculated.—Pythagoras .....	500
Trireme galleys in use.—The burning-lens known .....	400
War chariots in Gaul.—Arrack brought from India into Europe.—Electricity noticed.—Hemp, cordage (?), and sails (?).—Aristotle .....	300
Clepsydra.—Ballistæ.—Silver coin at Rome.—The olive.—Chinese wall.—Hannibal Lucullus introduces cleansing soap from Gaul—sal-ammoniac from Egypt.—Solar year fixed .....	200
	100
Christ born.—Seneca.—Strabo.	A.D.
First sea voyage to India, probably .....	3
Stained-glass windows—the vine—Saw-mills—Monachism—all in Germany .....	300
The Western Empire.—Public lights at Antioch.—Church bells .....	400
The dark ages commence.	
Franks Christianized.—Silk-worms in Europe.....	500
Hops.—Quill pens.—Latin disused.—Mahomet I. ....	600
Charlemagne names the days and months .....	800

	Date A.D.
Oxford and Cambridge Universities.—First book.—Alfred the Great .....	900
Arabic notation in Europe.—Wheel clocks in use.—The first crusade .....	1100
The three last crusades.—The sugar cane in Sicily.—Coal as fuel.—The corporation of London.—The Popish inquisition.—Saladin .....	1200
English parliaments.—English in our law courts.—Gunpowder.—Cannon.—Mari- ners' compass.—Printing.—Engraving.—Oil painting.—Coaches.—Roger Bacon. —Wiclif.—Tamerlane .....	1400
America.—Columbus's four voyages, from 1492–1504.—Cape of Good Hope.— Indian Sea.—Vasco di Gama, 1499.—John and Sebastian Cabot, 1497.—Public road and bridges through Western and Southern Europe.—Luther.—The Re- formation .....	1500
Logarithms.—Watches.—Barometer.—Telescope.—Mercator.—Italian book-keep- ing.—Jupiter's satellites discovered.—Copernicus.—Galileo.—Magelhaen's voyage, 1520.—Drake's voyage, 1580 .....	1600
Royal Society.—Newton.—Sextant.—Chronometers.—Greenwich Observatory.— Tea into Europe.—Clive.—Penn.—South Sea Company.—Cod and herring fisheries.—Semaphore.—New style calendar .....	1700
Anson's voyage (1744) .....	
Cook's last voyage (1779) .....	
La Perouse (1788) .....	
Vancouver (1795) .....	
Watt's steam engine (1796) .....	1800 to present date.
Napoleon.—Nelson.—Embassies to China and Japan.—Vaccination.—Gas lights. —Life-boats.—Public docks.—Public coaches and diligences.—Newspapers abundant .....	
Steam navigation.—First steam-ship 'Savanna' crosses the Atlantic, 1819.—Rail- way system, 1820.—Electric telegraph, 1830.—Law of tides—of storms.— Gold in California—in Australia .....	

## No. II.

(P. 57.) From the interest that belongs to observations of earthquakes in the Southern Hemisphere, hitherto so seldom recorded, I append the following extracts from the letter of an intelligent friend, referring to the New Zealand shock of 1854–55, written very soon after the event. The writer is a civil engineer.

*The New Zealand Earthquake.*

“Wellington, 23rd January, 1855.

“Whilst sitting reading and talking at 8.50 p.m., I felt the house (which had been shaking with the occasional N.E. gusts so usual at Wellington) give a very extraordinary shake, which seemed to continue, and was accompanied by a fearful noise. I at once jumped up, rushed, as well as the violent motion would permit me, into the front garden, the motion increasing in violence, accompanied by a roaring as if a large number of cannon were being fired near together, and by a great dust caused by the falling chimneys. The motion at first was a sharp jerk back and forwards in a N.E. and S.W. direction, increasing in extent and rapidity, until I got into the garden—say 25 seconds; it was then succeeded by a shorter and quicker motion at right angles, for nearly the same time, still increasing, but appearing to be perfectly in the plane of the horizon. This was followed by a continuation of both, a sort of vorticeous motion, exactly like the motion felt in an ill-adjusted railway carriage on a badly-laid railway at a very high speed, where one is swayed rapidly from side to side. This was accompanied by a sensible elevatory impulse; it gradually subsided; and the above, constituting the first and greatest shock, lasted altogether, I should say, 1' 20" or 1½' at Wellington. The earth continued to vibrate all night like the panting of a tired horse, with occasional shocks of some violence, decreasing in frequency and violence towards morning, and nearly all in the N.E. S.W. direction, some of them a single jerk back and forwards like that of one railway carriage touching another, but generally they were followed by a vibration gradually decreasing. These lasted, with increasing intervals, until I left Wellington on the 11th April. For the first week after the first shock, the vibration never wholly ceased. All the brick buildings in Wellington were overthrown, or so injured, as to necessitate their removal; the Hutt Bridge was thrown down; the hill-sides opposite Wellington were very much shaken, as evidenced by the many bare patches with which they were chequered fully to the extent of one-third of their surface, whence trees had been

shaken off: this range, particularly its lower portion, appeared to have been the most shaken. It is called the Rimatuka Range, and divides Port Nicholson and the basin of the Hutt from the Warumapa Valley, where the earthquake was felt with greater violence than at Wellington, the ground having opened in many places 8 or 9 feet, and sunk in one place for 300 yards square to a depth of 8 or 9 feet. The cracks are very frequent, and at first were of considerable depth (deemed unfathomable, because people could not see their depth), perhaps 15 or 20 feet in depth, and extending for many hundred yards. Ploughed ground and mud, dry river- or pond-beds were thrown up into all sorts of undulations like a short cross sea, the ridges in some cases 2 feet in height, the prevailing direction of cracks and ridges being generally at right angles to the apparent line of force, N.E. S.W. The strata about Wellington and the Rimatuka are a sort of shale and clay-slate, all broken into pieces not bigger than road-metal, with yellow clay joints; and in places where the overlying clay has been cut through by roads, one can see the cracks caused by former earthquakes filled up by a different-coloured material. I should mention the great sea-wave which came in immediately after the first shock, about 5 feet higher than the highest tide inside the harbour, and 12 feet higher outside; the tide (*i. e.* water-surface) continued ebbing and flowing every 20 minutes during the night, and was most irregular for a week, ebbing further than ever known before. After that time it became more regular; and now the ebb and flow is the same as before the earthquake; but since that, it does not come at high-water within 3 or 4 feet of its former height, proving that the whole southern part of the northern island has been raised, the elevated portion commencing at Wangarua, on the west coast, and going round to Castle Point on the east, where it terminates. The vertical elevation is greatest at the Rimatuka Range, outside Port Nicholson, and becomes *nil* at the above-mentioned points. The shock was felt at Nelson almost as badly as at Wellington, slightly at Canterbury and Ahuriri. It was most violent on the sides of hills at those places, and least so in the centre of the alluvial plains.

"The great shock continued at any one point longer, the further it had diverged from its apparent centre of action opposite Wellington, and became less violent, the motion being slower and not to such an extent. This I think plainly proves (if anything were wanting to prove) Mr. Mallet's wave theory: any person of the slightest perception experiencing the shock and comparing the statements of persons who had felt it in different places could come to no other conclusion. I do not think the thermometer or barometer was affected; I had no opportunity of observing myself; but so I heard; nor was the compass acted on more than was due to the motion.

"The captain of the vessel I went in to Ahuriri was outside Port Nicholson, lying-to in a gale, and thought his vessel had struck, and was dragging over a reef of rocks; the next morning he passed hundreds of dead fish all of one sort, a species of ling, whose habit it is to lie on the bottom. The shock was also felt by the 'Josephine Willis,' 150 miles off the coast. I only regret, time and want of means prevented my making more accurate observations, and even giving you those I did make in greater detail. W. C. B."

[The direction of primary shock mentioned by the writer is in the line of the mountain-chain, reaching from the interior down to Wellington, and also in that pointing to Tongaroa and other volcanic cones.—R.M.]

### No. III.

#### BIBLIOGRAPHY OF EARTHQUAKES.

At the period of publication of the Second Report on Earthquakes, it was my intention to have prepared a complete Bibliography of Earthquakes, the want of some such index having been much felt by myself, at former periods. Subsequently, however, I found that my friend, Professor Perrey, of Dijon, had had such a work in progress for some years; and he has since published his Bibliographical Catalogues in the 'Mémoires de l'Académie Imp. de Dijon,' vols. xiv. and xv. 2nd ser., for 1855-56, which contained, in alphabetical order, one thousand eight hundred and thirty-seven different works on Seismology. Even yet, however, the store of literature in this speciality are not completely taken stock of. I have hence deemed it best simply to publish, in the following lists, such works as I have found in the several European libraries named at the head of each separate list, along with one in which works, that from various sources have met my eye, are collected. The materials thus given will be, I should hope, of some present service to scientific

travellers abroad; and such portions as are new can be intercalated with future editions of more perfect catalogues, such as M. Perrey's. The following is the order of the library lists:—

1. British Museum.
2. Royal Society of London.
3. Trinity College, Dublin.
4. Royal Library, Berlin.
5. Naturforschenden Freunde of Berlin.
6. Royal School of Mines, Berlin.
7. Library of the University of Göttingen.
8. Royal Library of Munich, Bavaria.
9. Royal Library of Dresden, Saxony.
10. Library of Gand, Belgium.
11. Library of the Mineralogical Museum, Naples.
12. Works on Seismic and Volcanic Subjects from various sources.

*Library of the British Museum.*

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Supplement to the Bishop of London's Letter on occasion of the late Earthquake. 8vo. London, 1750.

Serious Thoughts on the Earthquake at Lisbon. 8vo. London, 1755.

Reflections, Physical and Moral, upon the uncommon Phenomena which have happened from the Earthquake at Lima to the present time. 8vo. London, 1756.

A short and pithie Discourse concerning the engendering, tokens, and effects of all Earthquakes in generall. By T. T. 4to. London, 1580. (Black letter.)

A most true relation of a very dreadfull Earthquake which began upon the 8 December, 1612, and still continueth in Munster, in Germanie. 4to. London, 1612. (Black letter.)

Vera Relazione del Spaventevole Terremoto nelle provincie di Calabria citra et ultra. 4to. Roma, 1638. Also editions in Latin, Neap. 1638; Angl., London, 1638.

Sopra il Terremoto Lezioni tre. 4to. Spoleto, 1732.

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A true and impartial Account of the strange and wonderful Earthquake which happened in most parts of the City of London, 8 September, 1692. Folio.

A Philosophical Discourse of Earthquakes, occasioned by the late Earthquake, September 8, 1692. By C. H. 4to. London, 1692.

A true and perfect relation of the Earthquake at Port Royal in Jamaica, 7 June, 1692. Folio. London.

A full Account of the late dreadful Earthquake at Port Royal in Jamaica, June 22, 1692. In two letters from the minister of that place. Folio.

A sad and terrible relation of the dreadful Earthquake which happened at Jamaco [sic]. 12mo. London, 1692.

A Practical Discourse on the late Earthquakes, with an Historical Account of Prodigies and their various effects. By a Reverend Divine. 4to. London, 1692.

Epistola ad Regiam Societatem Londinensem, qua de nuperis terræmotibus disscribitur et

- vera eorum cause eruuntur. 4to. London, 1693. Proposes to account for earthquakes occurring on astrological grounds.
- An account of the late terrible Earthquake in Sicily. Done from the Italian copy printed at Rome. 4to. London, 1693.
- The Earth twice shaken wonderfully; or an analogical Discourse of Earthquakes. By I. D. R. [Rouffional], French minister. 4to. London, 1693-94. 47 pages.
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- Trattato universale di tutti li Terremoti occorsi e noti nel mondo con li casi infausti ed'infelici pressagili da tali Terremoti. 4to. Nell' Aquila, 1652. 146 pages.
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  2. „ *Beschluss der Beiträge, ib. 1794.*
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- Dei Terremoti di Bologna: opuscola di D. Michele Augusti. Bologna, 1780 (181 pp. An examination of the connexion between "Terremoti" and "Aeremoti" or meteorological phenomena).
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- Ueber die Erdbeben und den allgemeinen Nebel, 1783. von Johann Ernst Basilius Wiedeburg. Jena, 1784 (86 pp.).
- Ragionamento del terremoto del Nuovo Monte, del aprimento di terra in Pozuolo nell' anno 1538. Per Piero Giacomo da Toledo. Napoli, 1539 (28 pp. Chiefly in the form of a dialogue, with an odd old woodcut of the eruption in which Monte Nuovo was produced).
- Dell' incendio di Pozuolo. Marco Antonio dei Falconi, all' illustrissima Marchesa della Padula. 1538 (41 pp. With the same woodcut as the last).
- Werden und Seyn des vulcanischen Gebirges. Empirisch dargestellt von W. H. C. R. A. von Ungern-Sternberg. Mit 8 Abbildungen. Carlsruhe, 1825 (320 pp. Chiefly mineralogical and geological).
- Carolus Cæsar de Leonhard, Historia antiqua vulcanorum montium. Heidelbergiæ, 1823 (14 pp. A short and unimportant university thesis, referring only to the ancient classical authors).
- Schreiben des Herrn Ignatz v. Born, über einen ausgebrannten Vulkan bei der Stadt Eger in Böhmen. Prag. 1773 (16 pp. Not important).
- Considérations sur les montagnes volcaniques: mémoire lu dans une séance de l'Académie Electorale des Sciences et Belles Lettres de Mannheim, le 5 Novembre, 1781. Par M. Collini. Mannheim, 1781 (59 pp.).

- Van der Wyck, Uebersicht der Rheinischen und Eissler erloschenen Vulkane und der Erhebungs-Gebilde. Mannheim, 1826 and 1836 (2 edits. 174 pp. Apparently a very good account of the extinct volcanoes of the district of the Rhine, between Coblenz and Bonn).
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- Raspe, An account, &c. (A translation of the last-mentioned. 136 pp.).
- Faujas de St.-Fond, Minéralogie des volcans. Paris, 1784 (511 pp.).
- Ducarla, Du feu souterrain. Paris, 1783 (54 pp.).
- Joh. Steininger, Die erloschenen Vulkane in der Eifel und am Nieder-rheine. Mainz, 1820 (180 pp.).
- , Neue Beiträge zur Geschichte der rheinischen Vulkane. Mainz, 1821 (116 pp.).
- Die Vulkane älterer und neuerer Zeiten, physicalisch und mineralogisch betrachtet von Franz v. Beroldingen. 2 Th. Mannheim, 1791 (293 and 406 pp. Apparently a good résumé of what had been previously written on the subject).
- Karl Wilhelm Nose, Beiträge zu den Vorstellungsarten über vulkanische Gegenstände. Frankfurt am Mayn, 1792 (457 pp.).
- , Fortsetzung der Beiträge, u. s. w. Frankfort am Mayn, 1793 (228 pp.).
- , Sammlung einiger Schriften über vulkanische Gegenstände und den Basalt. Frankfurt am Mayn, 1793 (344 pp.).
- C. N. Ordinaire, Histoire Naturelle des Volcans, comprenant les volcans soumarins, ceux de boue, et autres phénomènes analogues. Paris, 1802 (342 pp. The subject discussed geologically).
- Besides many other books, both on earthquakes and volcanoes, the names of which have already been obtained elsewhere.

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- Gundinger (A.), Theorie der Vulkan. 8vo, Wien, 1840.
- Kries (F.), Over de Oorzaken der Aardbevingen. 8vo. Utrecht, 1820.
- Krüger (T. G.), Gedanken über d. Ursachen d. Erdbebens. 8vo. Halle, 1756.
- Gruithuisen (Fr. v. P.), Gedanken über die Ursachen der Erdbeben. 1825.
- Gumprecht (T. E.), Die vulkanische Thätigkeit auf d. Festlande von Africa. Berlin, 1843.

*Royal Library, Dresden.*

- Commentatiuncula de Terræmotu, pronunciata a Martino Weindrichio Professore Physices in Gymnasio Vratisl. Vratislavie, 1591.
- Dissertazione sopra le fisiche e vere cause de' terremoti, del Sig. de' Scotti di Cassano. Praga, 1788.
- D. Johann Gottlob Krügers, Gedanken von den Ursachen des Erdbebens, nebst eine moralische Betrachtung. Halle und Helmstadt, 1756.
- A French Translation of Hales's Considerations on the Physical Cause of Earthquakes. Paris, 1751.
- Historisches kritisches Verzeichniss alter und neuer Schriftsteller von dem Erdbeben. Von M. C. G. G. Schneeberg, 1756. Small, and worth getting, if possible, for the Catalogue of Authors.
- Christlicher gründlicher Undersicht von den Erdbeben. Von Johann Burgower der Artzneyen Doctoren zu Schaffhausen. Gedruckt zu Zurich, 1657.
- Kurze Beschreibung des Erdbebens, welches den 5ten Februar 1783, Messina und einen Theil Calabriens betroffen. Aus dem Italienischen des Herrn Michael Torun. Nürnberg, 1783.
- Die Erdrevolutionen, oder Beschreibung und Erklärung des in Spanien am 21 März 1829, ausgebrochenen grossen Erdbebens. Von B. A. E. Weyrich). Leipzig, 1830.
- Betrachtung über die Ursachen der Erdbeben, 1756.
- Conjectures physico-mécaniques sur la propagation des secousses dans les tremblements de terre, et sur la disposition des lieux qui en ont ressenti les effets. (Probably Paris) 1756. -Very remarkable. He speaks of chains of mountains as long levers communicating the volcanic force applied at one end to the other, the principal effect being felt at that other, as, when a long row of balls is struck at one end, the last one moves. He says also that those forces are not so much felt in the extremities of branch chains, because these are composed of more sandy materials, which do not transmit the shock so well. There is also much more about the action of subterranean bodies of water, &c. The book is small. 52 pages.

Lettre d'un ecclésiastique de Paris à un curé de province, sur les derniers tremblements de terre. Paris, 1756.

Lezioni tre sopra il tremuoto, &c. (No name.) Roma, 1748.

Unglücks-Chronica vieler grausamer und erschrecklicher Erdbeben Hamburg. Gedruckt bei Thomas von Wiering, im güldenem A B C, bei der Börse, 1692.

Also many Abhandlungen seen in other libraries.

*The Library at Gand, Belgium.*

Histoire des anciennes révolutions du globe terrestre, avec un relation chronologique et historique des tremblements de terre arrivés sur notre globe depuis le commencement de l'ère Chrétienne jusqu'à présent. 1 vol. 8vo. Amsterdam, 1780.

Dainetus Sennertus, Curator Levinensis, Epitome Naturalis Scientiæ. Amsterdam, Jno.

Raverstern, 1651. Terræmotus in part. 1 vol. 12mo.

Antonii Galatei Liciensis, &c. Elementorum. Basilæ, per P. Pernam, 1580. Terræmotus in part. 12mo.

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*The whole that occur in the Catalogue Raisonné of the Library of the Royal Mineralogical Museum, Naples.*

[Note.—There is no classed Catalogue of the Royal Library at the Museo Borbonico; and it was found impossible to procure any list of the Earthquake works it may possess.]

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—, —, accaduto in Napoli, il dì 5 Giugno 1688. 4to. Napoli, 1688.

—, —, del danno cagionato dal tremuoto del dì 7 Giugno 1695, nella città di Bagnora, Oriseto, e luoghi vicino Roma e Napoli. 4to.

Andrea de Leone, Giornale e notizie dei tremuoti accaduti l'anno 1783. Parte 1a e 2da. Nap. 1783.

Alberto Nota, Del tremuoto avvenuto nella provincia di S. Remo. Pinerolo, 1832.

Leopoldo Pilla, Istoria del tremuoto che ha devastato la costa toscana il dì 14 Agosto 1846. Fig. 8vo. Pisa, 1846.

Baldassarre Spampinato, Osservazioni su i tremuoti. 4to. Catania, 1818.

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Andrea Lombardi, Cenno sul tremuoto avvenuto in Tito, il 1 Febb. 1828. Potenza, 1829.

Gottardo Zenoni, Memorie storico-fisiche sul terremoto. 8vo. Cremona, 1783.

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Ignazio de Partenione, Descrizione del terribile terrem. del 8 Febb. 1783. 4to. Nap. 1784.

Franc. Antonio Grimaldi, Descriz. dei tremuoti accaduti nelle Calabrie nel 1783. Fig. 8vo. Nap. 1784.

Gabriele Pape, Ragguaglio istorico-fisico del tremuoto accaduto nel regno di Napoli il 26 Luglio 1805. 8vo. Napoli, 1806.

Giuseppe Saverio Poli, Sul tremuoto del 26 Luglio 1805. 8vo. Nap. 1805.

Tommaso Mannesi, Accenti lagrimevoli sulle rovine di Rostano pel tremuoto della notte del 24 Aprile 1836. 8vo. Nap. 1836.

Michele Augusti, Dei terremoti di Messina e di Calabria dell' anno 1783. 8vo. Bologna, 1783.

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Nicola Zupo, Riflessioni sulle cagioni fisiche dei terrem. accaduti nelle Calabrie nell' anno 1783. 12mo. Nap. 1784.

Procopio Golimi, Lettera su i tremuoti di Messina e Calabria del 1783. 12mo.

Bartolommeo Gondolfi, Sulle cagioni del tremuoto. 12mo. Roma, 1787.

Francesco Ferraro, Memoria sopra i terremoti della Sicilia. Fig. 8vo. Palermo, 1823.

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William Hamilton, Relation des derniers trembl. de terre arrivés en Calabre et en Sicile. 12mo. Genève, 1784.

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- Ragor, Von dem Erdbibem, ein gründlicher Bericht, u. s. w. Basel, 1578.
- Bernherz, Terræmotus; das ist gründlicher Bericht von dem Erdbeben, u. s. w. Nürnberg, 1616.
- Ferrara, Descrizione dell' Ætna.
- Agatio di Somma, Historico racconto dei terremoti della Calabria dell' anno 1638, fin anno 1641. Napoli, 1641.
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- Histoire des anciennes révolutions du globe terrestre.* Amsterdam, 1752.
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- Rapport de Vassali-Eandi sur les tremblemens de terre du 2 Avril 1806. (Quoted in Perrey's memoir on the Earthquakes of the Basin of the Danube, p. 6.)
- Terra tremens, die zitternd oder bebende Erde. Einfältig doch klar und deutlicher Bericht, was Erdbeben seyen, u. s. w., von M. P. S. A. C. Nürnberg, 1670.
- Castelli, *Incendio del monte Vesuvio, &c.* Roma, 1632.
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 Jac. Phil. Maraldi, Observations sur les tremblements de terre arrivés en Italie depuis le mois d'Octobre 1702, jusqu'au mois de Juillet 1703. In Hist. de l'Acad. des Sciences de Paris, 1704. Hist. p. 8.  
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 Sopra....., Sur les petits mouvements apparents observés dans les murs et les grands instrumens d'observatoire de Modena. Par M. J. Bianchi. 4to. Modena, 1837.  
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 Cotte, Tab. Chron. de princip. Phénom. Météorologiques, &c. Journal de Phys., vol. lxx.

## No. IV.

## CATALOGUE OF PERREY'S MEMOIRS.

The immense and long-continued seismic statistics of Prof. Perrey are scattered throughout a multiplicity of Journals of various Learned Societies and elsewhere, and many of them with difficulty accessible in Great Britain.

The author has, at my request, favoured me with the following complete Catalogue of his seismological labours, which it may be serviceable to place in a collected form for reference.

- Perrey (Alexis), Chronique seismique. 1 vol. 8vo, MS. 1ère rédaction.  
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 —, Recherches historiques sur les Tremblements de Terre dont il est fait mention dans les historiens depuis le IVe siècle jusqu'à la fin du XVIIIème. Ibid. t. 13, p. 899-902, 2 Nov. 1841.  
 —, Recherches sur les Tremblements de Terre ressentis à l'Europe et dans l'Asie occidentale de 306 à 1800. Ibid. t. 13, p. 64-646, 26 Sept. 1842. Neuf cahiers seulement m'ont été remis au Secrétariat de l'Institut.  
 —, Note sur les Tremblements de Terre aux Antilles. Ibid. t. 16, p. 1283-1303, 12 Juin, 1843.  
 —, Nouvelles Recherches sur les Tremblements de Terre ressentis en Europe et dans les parties adjacentes de l'Afrique et de l'Asie de 1801 à Juin 1843. Ibid. t. 17, p. 608-625, 25 Sept. 1843.  
 —, Mémoires sur les Tremblements de Terre, en France, en Belgique, et en Hollande, depuis le IVe Siècle jusqu'à nos jours. 1843.  
 —, Mémoire des Sav. Étr. et Mém. Cour. de l'Académie de Bruxelles, t. 18, 4to. 110 pp. et 2 pl. avec Suppl. MS.  
 —, le même. 1 vol. 4to, MS. 1ère rédaction avec addit. MS. de M. Quetelet.  
 —, Liste des Tremblements de Terre ressentis en Europe pendant l'année 1843. Ibid. t. 18, p. 393-403, 11 Mars 1844.  
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 —, Sur les Tremblements de Terre de la Péninsule Scandinave. Voyages en Scandinavie de la Com. Sc. du Nord. 6 div. Géog. phys. t. 1, p. 409-469. Tir. à part. Paris, 1845. 8vo de pp. 65, avec Suppl. MS.  
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 —, Sur les Tremblements de Terre dans le bassin du Danube. Ibid. t. 9, 1846. Tir. à part. 8vo de pp. 82, avec Suppl. MS.  
 —, Note sur les Tremblements de Terre en Algérie et dans l'Afrique septentrionale. Mém. de l'Acad. de Dijon, 1845-1846, p. 299-323. Tir. à part. 8vo de pp. 24, avec Suppl. MS.  
 —, Sur les Tremblements de Terre aux Antilles. Ibid. p. 325-332. Tir. à part. 8vo de pp. 68, avec Suppl. MS.  
 —, Liste des Tremblements de Terre ressentis pendant les années 1845 et 1846, avec Supplément pour 1844, et indicative Sommaire des autres phénomènes météorologiques. Ibid. p. 393-479. Tir. à part. 8vo de pp. 87.

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### *Desiderata—Ill-understood Phenomena, &c.*

*Great Sea-Waves.*—Perhaps the best account that has yet been given of the phenomena of great sea-waves (due beyond question to earthquake or volcanic movement of sea-bottom), was communicated by Prof. Bache to the American Association for the Advancement of Science, and was reprinted along with a paper "On the Tides of the Atlantic and Pacific Ocean," in 1856, in a separate form by Prof. Bache, at New Haven for private circulation, from which the following are extracts.

On the 23rd of December, 1854, a violent earthquake occurred in the neighbourhood of the Island of Nippon (Japan), the local sea-waves of which wrecked the Russian frigate 'Diana,' anchored in the harbour of Simoda. A correspondent of the 'New York Herald,' writing from Shanghai, states,—“At 9 A.M. on the 23rd of December, weather clear, therm. 72°, barom. 30°, a severe shock of an earthquake was felt on board the frigate, shaking the ship most severely. The shock lasted full five minutes, and was followed at quick intervals by rapid and severe shocks for thirty minutes.” At 9h. 3m. A.M. the sea was observed washing into the bay in one immense wave 30 feet high, with awful velocity; in an instant the town of Simoda was overwhelmed and swept from its foundations. “This advance and recession of the waters recurred five times”. . . “by 2h. 30m. P.M. all was quiet.” The log-book of the 'Diana' states that “the disturbance commenced at 9h. 15m., and that the rising and falling of the water in the bay produced a sudden variation of depth from less than 8 feet to more than 40 feet. The frigate was by this laid four

times upon her side, once in less than 4 feet of water." Commodore M. C. Perry, U.S. Navy, states,—“That the whole eastern coast of Japan seems to have suffered from this calamity. Yedo itself was injured, and the fine city of Osaka entirely destroyed. At 3 P.M. a fresh west wind was blowing at Simoda. The agitation of the water and the movement of the vessel had become very slow; barom. 29°·87, therm. 10°·5 Reaum. (=55°·63 Fahr.).”

From other sources quoted by Prof. Bache, it appears that on the same day (23rd Dec.), at Peel's Island, one of the Bonin Islands, there was also (the hour not stated) a sudden wave rise of 15 feet above high water, followed by a recession which left the reefs entirely bare. The tide continued to rise and fall at intervals of fifteen minutes, gradually lessening until the evening. Again on the evening of the 25th of December (as to which time there is no account of a second earthquake), the water rose in like manner 12 feet.

The United States Coast Survey, so ably superintended by Prof. Bache, possesses stations of observation furnished with self-registering tide-gauges, at San Diego, San Francisco and Astoria, on the Pacific Coast; and Prof. Bache presented to the Association the curves traced by those instruments, in which the comparative heights and times, and the mean heights and times at San Francisco and San Diego, are given; also the tidal curves for both, with the abnormal oscillations superimposed; and lastly, three diagrams, in which the tidal level being reduced to a horizontal line, the abnormal waves alone are shown, for Astoria, San Francisco and San Diego.

I can only refer to the original for the full results deducible from these valuable observations, and repeat here in brief some of their facts:—

“The San Francisco curve presents three sets of waves of short interval: the first begins at 4h. 12m. and ends at 8h. 52m., the interval being 4h. 40m.; the second begins at 9h. 35m. and ends at 13h. 45m., the interval being 4h. 10m.; the beginning of the third is about 13½h., and its end not distinctly traceable. The crest of the first large wave of the three sets occurred at the respective times of 4h. 42m., 9h. 54m., and 14h. 17m., giving intervals of 5h. 12m., and 5h. 23m.”

“The average time of oscillation of one of the first set of waves was 35m., one of the second 31m., and one of the third about the same. The average height of the first set of waves was 0·45 foot on a tide which fell 2 feet; of the second 0·19 foot on a tide which rose 3 feet; and of the third 0·19 foot on a tide which fell about 7 feet; the phenomena occurring on a day when the diurnal inequality was very considerable. The greatest fall of the tide during the occurrence of the first set of waves was 0·70, and the corresponding rise 0·60 foot. In the second set the corresponding quantities were 0·30 and 0·20 foot; in the third *these waves would not have attracted general attraction.*” There is a general analogy in the sequence of the waves of the three sets, which seem to mark them as belonging to a recurrence of the same series of phenomena. The series itself looks like the result of several impulses, not of a single one, the heights rapidly increasing to the third wave, then diminishing as if the impulse had ceased, then renewed and then ceased, leaving the oscillation to extinguish itself. If we had a corresponding account of the facts as they occurred at Simoda, the subject would lose the conjectural or rather the incomplete character that belongs to it. Although there is no account of the place of origin of the earthquake, yet its violence on the Japanese coasts and its diminished effects at Peel's Island, as well as the times of arrival of the waves at the Japanese and Pacific American coasts, prove that it must have been beneath the sea, and not far distant from Japan. “Five distinct waves in succession rolled in at Simoda; eight are shown by the San Francisco gauge, of which seven were of considerable height.” It seems not improbable, although this does not appear to have occurred to Prof. Bache, that three of the San Francisco waves may have been *reflected waves* only. The highest wave at Simoda was estimated at 30 feet, at Peel's Island 15 feet, at San Francisco 0·65 foot, and at San Diego 0·50 foot.

At San Diego, the gauge shows distinctly the same three series of waves. The first begins at 1h. 22m. later than at San Francisco, correcting for difference of longitude, and ends 52m. later. The interval is 30m. less than at San Francisco, the oscillations being rather shorter than at the latter point. The second begins at 54m. later than at San Francisco and ends 34m. later. The third begins about 54m. later than at San Francisco. The average time of oscillation of the

first set is 31m., of the second 29m., being thus respectively 4m. and 2m. shorter than at San Francisco. The average height of the first set of waves was 0·17 foot lower than at San Francisco, and the second as much higher. This fact, taken with the difference in the times of oscillation, induces Prof. Bache to suppose that the difference in the two series was due to interference, which is also suggested by the position of San Diego in reference to the islands separating the Santa Barbara Sound from the ocean.

The difference in the periods of tide on the arrival of the waves at each place would tend to produce discrepancies. The first series at San Diego arrived on a rising tide of 4 feet, while at San Francisco it was upon a falling tide of 2 feet. The second at San Diego arrived at near high water, and was chiefly upon a falling tide of 7 feet, while at San Francisco it was upon a rising tide of 4 feet.

The forms of the waves accord remarkably at both stations.

The tide-gauge at Astoria gives less instructive results, the bar at the entrance of the Columbia River having no doubt broken up and greatly reduced the waves, even if they arrived at the entrance unbroken. The gauge showed a disturbance, but irregular and confused, which was also apparently preceded by (other) unusual oscillations of the water; and Prof. Bache sees reason to think that the San Diego gauge indicates disturbances of the water of an abnormal character *previous* to the great earthquake shock, as well as following it at intervals for several days. The normal time for high and low water does not seem to have been disturbed by the superposition upon the tide-wave of the abnormal or earthquake waves.

From these results Prof. Bache draws the following conclusions as to the rate of translation of the great sea-waves of the earthquake.

The latitudes and longitudes of the stations are:—

	Lat. N.	Long. W.	Time. h. m.
San Diego .....	32° 42'	117° 13'	7 49
San Francisco.....	37 48	122 26	8 10
Simoda .....	34 40	121 62	14 44

The distance from San Diego to Simoda is therefore 4917 nautical miles, and from San Francisco to Simoda 4527 nautical miles. Assuming the first account of the disturbance at Simoda at 9 A.M. or at 22d. 23h. 44m. Greenwich mean time, and the first great wave 30 minutes afterwards, Prof. Bache proceeds to calculate the rate. There appears to be some typographical errors in the figures, which slightly affect the result which he arrives at, viz. 363 miles per hour, or 6·0 miles per minute. Correcting the erroneous figures, the result would appear to be,—the first disturbance at San Francisco was at 23d. 12h. 22m., or 12h. 38m. after that at Simoda, and the first great wave at 23d. 4h. 42m., giving the same interval (of 30m.). The distance and time therefore give a rate of 368 miles per hour, or 5·966 miles per minute.

Assuming the second account (9h. 15m.), the time of transmission when reduced would be 12h. 13m., and the rate of translation 370 miles per hour, or 6·20 miles per minute.

The San Diego observations, assuming 9h. 0m. as the time of transmission at Simoda, give 13h. 50m., which, when reduced, gives a rate of translation of 355 miles per hour, which is almost identical with the corrected reduction of the San Francisco observations.

Although not directly connected with our subject, it is interesting to state that Prof. Bache deduces from these results a probable mean depth for the Pacific Ocean on the paths traversed by these great sea-waves of from 2100 to 2500 fathoms. (See also Amer. Journ. of Science, vol. xxi. 2 ser. January 1856.)

I deem no apology needed for this lengthened abstract of Prof. Bache's communication, not only because it is, up to the present time, almost the only record of scientific pretensions, of the phenomena of earthquake great sea-waves, but as a model for those who may be engaged in tidal observations upon British or European coasts, of what is needed to make their results connect usefully with the requirements of those occupied in seismical inquiry. The extreme value of self-registering tide-gauges, and the great importance of multiplying these round our own coasts, and upon those of our Mediterranean and antipodal stations, are forcibly shown by the remark of Bache, that but for these instruments, the very

occurrence on the North American coast of these sea-waves, which had traversed the whole vast breadth of the Pacific, a distance equal to one-fifth of the earth's circumference, would have actually passed unnoticed. Had there been a competent self-registering tide-gauge at Simoda, we could probably have fixed exactly the spot beneath the ocean at which the earthquake disturbance originated.

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*There is also a class of doubtful great sea-waves, for the investigation of which such self-registering instruments would afford precious data.*

It has been many times observed at various stations round our own British coasts (as well as abroad), that abnormal tides have occurred, or that solitary waves of translation have reached the shore, at abnormal periods, or at uncertain periods of repetition, which could not be confounded with any recognized tidal phenomena.

Such waves have very customarily been referred to earthquakes for their origin of late years; yet very many examples occur in which there has been no account of contemporaneous earthquake, either in the offing at sea, or in any other direction. And the question arises, are such abnormal waves always to be attributed to earthquakes (whether observed or not), or may they possibly be produced by some nodal action or other disturbance far out at sea of waves of other classes, and if so, of what nature?

It will be advantageous to adduce some examples, and the rather, as I am enabled, through the obliging attention of the Commissioners of Public Works in Ireland, to state one of much interest and in some detail, of which no full account has yet appeared.

But first we may notice such an occurrence on the coast near Whitby, Yorkshire, copied from the York 'Herald' of March 8, 1856, for which I am indebted to Mr. William Gray of York.

" York, March 8, 1856.

" Robin Hood's Bay.—On Sunday last, the 2nd instant, at 10 A.M., the tide being then about two-thirds flood, the following phenomenon was observed:—The rocks, which had been bare just previously, were observed to be completely submerged. The water then fell back, and again returned, rushing with considerable force over the rocks and beach. This was repeated two or three times, the water running up a moderately inclined beach the distance of thirty yards.

" A remarkable phenomenon of the tides was observed at Whitby on the 2nd inst. At a quarter to ten o'clock in the morning, being an hour and a quarter before high water, the sea suddenly rushed up Whitby harbour, rising in different places from 18 inches to 3 feet, driving a laden lighter from its moorings, and causing much commotion amongst the small craft. It then receded, but was followed by other and similar waves, so that the tide appeared to ebb and flow six times in the space of little more than an hour. A vessel, which was entering the harbour at the time, was alternately afloat and aground on her passage up, according to the level of the water. About midnight of the same day, the harbour-officers observed a recurrence of the event, and in the first hour of Monday the rush of water appeared to be much more powerful than on Sunday morning. About eleven o'clock on Sunday night, Mr. Tose, the harbour-master, having observed a mark which indicates that the tide was sufficiently high for a vessel then in the roads to enter the harbour, went up the lighthouse and lit the gas-signal. On his return to the pier, he was astonished to find that though the tide ought to have risen higher, it had fallen considerably below the mark. Being afraid the vessel would take the harbour, he was about to extinguish the light, when suddenly the tide rose far above the mark above referred to. At Staithes and Robin Hood's Bay, the phenomenon was also observed. The rushes of water resembled what are known in some rivers as 'bores,' but on a much larger scale. Such phenomena often accompany subterraneous disturbances, and on some occasions they have been terribly destructive. As no earthquake has been felt in these parts recently, it is difficult to account for the phenomenon, and it can scarcely be referred to atmospheric causes. It would be interesting to learn whether a similar occurrence took place on other parts of the coast. Dr. Young, in his 'History of Whitby' (page 792), remarks, 'To volcanic



agency may be ascribed this remarkable phenomenon, that on the 17th July, 1761, the tide rose and fell at Whitby four times in an hour."

Analogous phenomena have been observed at Pegwell Bay, on the southern coast, during the present year.

The following documents refer to the observations of such waves made upon the coast of Wexford, Ireland, in 1854.

The 'Wexford Independent,' a local journal of the 27th September, 1854, gives the following account:—

"Extraordinary Phenomenon.—We are indebted to Mr. William Campbell, the professional helmet-diver, who has done so much for the improvement of the new pier of Kilmore, by blasting and removing the rocks which impeded its entrance, for the following account of an extraordinary phenomenon, witnessed there on Saturday evening, Sept. 16th, 1854. 'I was' (writes Mr. Campbell) 'in one of our boats seeking after some implements, and not looking seawards, when, on a sudden, I heard a mighty rush of water against the back of the pier, and in a moment it came sweeping round the pier-head, full 3 feet high and abreast. It was within one hour and a half of low water at the time. The inner dock was crowded with the small sailing craft of the place, and quite dry, the tide being more than four hours on ebb. In less than five minutes every boat was afloat, and we had high water. In five minutes more the water ebbed again to the lowest spring-tide. This was repeated seven times in the course of two hours and a half. St. Patrick's Bridge was alternately dry and covered to the extent of a mile, and the sea formed a cascade from end to end of it, the influx appearing to come from the east. At the same time the sea was not by any means rough nor heaving. Standing on the top of the parapet wall of the pier, I could descry two different currents running parallel, and counter currents to these quite visible, the discoloured water running east at a rate of ten or twelve miles an hour, and the intervening water of the original green hue, and stationary. These tide currents were as far out as the shore of the Saltee Islands. I can only compare the current to the opening of a sluice gate. There was no damage done to any of the craft, more than the bursting of a few warps. Had the occurrence taken place at the period of high water, the result would have been the complete overflow of the land in the district, and consequent immense loss. We have often heard old people of that place say that on the Sunday after Lisbon was destroyed by the earthquake of November 1, 1755, the day being remarkably fine, the sea at Kilmore suddenly rose and fell in like manner. This occurrence the other day has been owing, no doubt, to some similar and distant cause.'"

The phenomena alluded to in the above paragraph, from the 'Wexford Independent,' are not unknown on the Waterford coast, and are there popularly termed 'death waves.' It is not very long since two ladies had a narrow escape of being washed out to sea at Dunmore, by a sudden wave, which surprised them whilst seated at a considerable distance above high-water mark on the beach.

Repeated instances are on record of such waves upon the north-east coast of England and upon the south-west coast of Ireland, as well as in many other places (see also Second Report, p. 47-48), and even on the east coast of Africa.

For the following, I am indebted to the Commissioners of Public Works, Ireland:—

"Office of Public Works, October 19, 1854.

"SIR,—I am directed to transmit herewith a copy of a report which the Board have received from James B. Farrell, Esq., County Surveyor of Wexford, respecting an extraordinary tidal phenomenon at Kilmore on the coast of that county on the 16th ultimo. The Board send this report, considering it will be interesting to you, on the subject of earthquakes, to which you are giving your attention.

"To Robert Mallet, Esq."

"W. MOONEY, *pro Sec.*"

"Wexford, October 10, 1854.—In compliance with the request of the Commissioners, contained in your note of the 22nd ultimo, I forwarded a newspaper in which was an account of the tidal phenomenon at Kilmore.

"Since then I have made inquiries along the coast, tracing from New Ross round by Ballyhack, Arthurstown, Duncannon, Hook Head, Slade, Fethard, Bannow, and on towards Carnsore Point.

"As far as Bannow nothing unusual was observed. The Coast-Guard near there,

although one was, as is customary, on the 'look-out' at the time of the occurrence, noted no disturbance. It appears to have been perceived about two miles east of this station, near the point indicated by the line A on the accompanying map, Plate XIII., and seems to have been confined between this and the line B. At 'Ballyhealy,' a little further east, it was not observed.

"From inquiries into the details of the appearance, I learned from Mr. Campbell at Kilmore, that six distinct ridges of water, about 2 or 3 feet high, passed from the west towards the east, very much discoloured and carrying with them large quantities of sea-weed. There was a considerable space between each pair in which the water was of its usual colour, and quite calm, as was the sea generally, there being no wind to disturb it.

"These ridges did not proceed in (broken?) waves, but in continuous lines, and passed on apparently unchecked, while the tide rose and receded on the shore within them, which it did seven times. It is stated that, at the second reflux, the water fell lower than it was ever known by the residents there to fall before.

"It would appear that the ridges maintained their velocity sufficiently to force back the ebb, which flows rapidly round Carnsore Point (nearly three knots an hour) until they passed St. Patrick's Bridge, where the ebb-tide regained its motion westward in the shape of the 'cascade' mentioned by Mr. Campbell in the printed account.

"The disturbance lasted, according to his statement, from 20 minutes past 4 to nearly 7 o'clock P.M.

"On inquiring at the 'Bar of Lough,' I found that at about half-ebb the watchman at the Coast-Guard Station, who was in the watchhouse, which is built on the edge of the sea, felt the floor tremble under his feet, and at the same time the fire-irons and other articles of furniture shook and rattled audibly. He was also startled by 'an extraordinary noise' outside. On going out to ascertain the cause, he found that a large wave was forcing back the ebb. This was repeated three times. The first wave only, however, was accompanied by noise.

"A schooner was lying inside the Lough, at the place marked C, from the master of which, I learned that his vessel was three times swung round, standing alternately to the flood and ebb. He was below, when he had the first intimation of it, and described his being affected with a strange sensation, as if he were getting sick. This I believe is not uncommon in cases of earthquake.

"Mr. Lett, R.N., the Coast-Guard officer here, upon whom I called, made to me a statement confirming what I had collected by inquiry.

"There seems little doubt that the whole thing was caused by a slight shock of earthquake.

"From the information I had at Kilmore from Mr. Campbell, I have laid down lines on the accompanying map, exhibiting the ridges as described by him, and endeavouring to illustrate, by the curved arrows, the action of the ebb-tide upon them.

"JAMES B. FARRELL, *Wexford County Surveyor.*"

"With reference to the communication addressed to you on the tidal action on Wexford coast, I may mention that since it was sent to you, further information shows that it extended beyond the limits marked by Mr. Farrell, having, by the report of the Coast-Guard, turned Carnsore Point: he has written to the Inspecting Commander of the Coast-Guard, to request he will follow it up, and ascertain how far north the effect was observed.

"Yours, dear Sir, faithfully,

"To Robert Mallet, Esq.  
21 Oct. 1854."

"JNO. RADCLIFFE."

Referring to Plate XIII., it would appear probable that the primary cotidal line of these waves was about in the direction C C of the heavy dotted line, and that the change of direction, on approaching the shore about B, was due to the conjoint effects, of the meeting ebb tidal-stream round Carnsore Point, of reflection at the Saltees, and of inequality of bottom on reaching the inshore shoal-waters.

An almost identical train of phenomena occurred at the same point upon the Wexford shore on Sunday, 12th September, 1841. The account is given by Milne, "On British Earthquakes," Edinb. New Philos. Journ. vol. xxxvi. p. 83, and copied 1858.

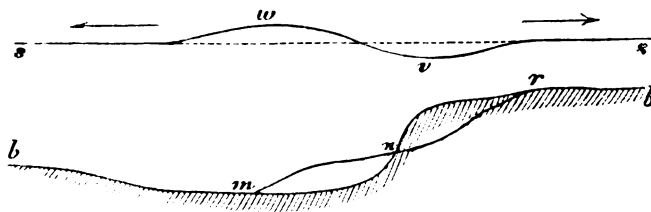
from a Wexford newspaper:—"The day was misty and dark, wind S.S.W. to S. Thunder heard at noon; wind lulled, and fog became dense. At Kilmore, ten miles south of Wexford, and directly opposite the Saltee Islands, about noon, a number of short, loud, smothered reports like cannon were heard. The tide had flowed considerably at the time, and the fishing-boats at the pier were all afloat, when, within the space of two or three minutes, the water suddenly receded from the pier, and people walked dry-shod where a little before there had been five to six feet of water. After a few minutes, again the tide began as suddenly to return; and, after resuming its level, continued to rise to high water in the usual way. There was no extraordinary commotion, only an increased surf. The sky cleared after thunder and showers."

The question, however, here chiefly in point is, whence come these waves? what is their origin? The direction of translation, on entering the wide Bay of Ballyteague, here was almost exactly from the south-west, and if transmitted from a considerable distance, the origin of disturbance must have been beneath the deep waters of the Atlantic Ocean, and it is scarcely probable that an earthquake blow sufficiently powerful to have originated waves so large after so long a transmission, should have occurred and *not* have been generally felt in the South of Ireland, where the hard and elastic characters of all the formations are so favourable to the distant transmission of impulses. It is equally difficult to assume, as here operative, a condition which upon coasts of shoal water and encumbered with banks and bars, may unquestionably originate great sea-waves, and which very probably is actually the cause of those of not unfrequent occurrence upon the east and south-east coasts of England.

Almost all great submarine banks are constantly subjected, at the same time, to aggregation by deposition, and to partial degradation, by the sweeping away of material along their bases and flanks, by tidal action, either constant or at certain periods of tide. Deposition takes place by vertical, or more or less inclined precipitation of suspended matter; this form of degradation, by horizontal removal. The conjoint effect is very frequently to *increase the steepness of the angle of slope of the degrading flank of the bank*, matter being constantly added on top and removed from lower down, and with most energy at a level intermediate between the surface-water and bottom.

A time arises, therefore, at which the angle of slope of the bank is increased beyond the limits of repose of the material, whether mud, sand or gravel, or any mixture of these; and then a great under-water slippage takes place, and a mass often of enormous magnitude at once slides from the top and flank of the bank down into deep water, and spreads and levels itself out upon the bottom, to be in its turn swept away and replaced by fresh materials and to give rise to another slippage. Thus, in figs. 9 & 10, if *s, s* represent the surface of the sea, *b, b* (fig. 9) the sea-bottom in

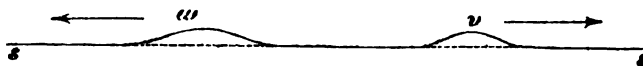
Fig. 9.



transverse section through the flank of the bank in a plane at right angles to the stream of abrasion; then, at the point where the equilibrium of repose of the mass is lost, the mass *r, n* slips and is *suddenly* transported from its original position to *n, m*. The effect upon the surface of the sea, is at the same moment to originate a positive and a negative wave, *w* and *v*, whose crests shall more or less approximate to the general line of the flank of the bank; and these will be immediately succeeded by two solitary waves of translation, a greater, *w* (fig. 10), and a less, *v*, whose motions of translation will be opposite.

The magnitude of the wave raised is dependent upon that of the mass of solid material that has suddenly changed its place, upon the depth of water in which the

Fig. 10.



slippage has occurred, upon the rapidity of the transposition, and in a minor degree upon the form and material of the portion of the bank that has slipped. Where the depth of water is very great, its effects at the surface may be quite insensible at the place; but when this low broad flattened wave of only a few inches becomes heaped up on shelving shores or tidal estuaries, it may then become very apparent, and perfectly so to accurate tide gauges. Where the water is comparatively shallow, as it usually is where large and heavy banks occur, there the undulatory effects on the surface, even at the seat of disturbance, will be considerable. We have then a simple mechanism abundantly sufficient to account for the occurrence of some such abnormal tide-waves or great sea-waves as have been noticed; but while thus a *vera causa*, is it the cause of any of those phenomena that have been observed, and which do not appear to have been accompanied by earthquakes? This, as well as all the hydrodynamic phenomena of such sea-waves, I would commend to the careful attention of future observers. (See First Report, p. 61.)

*Stoppage of Rivers.*—Throughout earthquake narratives, nothing is more commonly recorded amongst the secondary phenomena, than sudden derangements of the ordinary and prior regimen of springs, wells, and especially of rivers. Almost all such facts admit of simple explanation; and in the case of rivers, the sudden drying up or stoppage of their streams, has been most usually due to sudden damming up by the fall of *débris* of rocks from precipices, &c. across the river-beds, usually at narrow gorges, where the damming can easily take place, and whence it is, by the posterior rising of the waters, afterwards swept away or gradually removed by floods, &c.; often also on a grander scale, it arises from the occurrence of great landslips (in countries of deep alluvial or other little coherent formation), bulging out into the river-beds, and temporarily shutting them up, and either forcing the streams into new channels, or damming them up until the waters produce a debacle and sweep away the obstacle.

But not a few cases are upon record of sudden stoppages in the ordinary supply of water in river streams, not known to have been connected with any earthquake, or with any sufficient and explainable cause. Perhaps the phenomena cannot be more briefly set forth than by transcribing a notice from 'Chambers's Edinburgh Journal' for Jan. 19, 1839, No. 364. p. 412:—

"Late Stoppage of Rivers in the South of Scotland.—Most of our readers have probably read the accounts which appeared in the newspapers of a simultaneous stoppage of the rivers Teviot, Clyde, and Nith, on the 27th of November last; yet, as many may not have heard of it, and few may have paid to it the attention which it deserves, we are glad to have the opportunity afforded us of bringing the circumstance under the especial notice of our readers. It has, we are glad to find, been taken up, as a subject worthy of scientific investigation; and in this we have been invited to assist, by endeavouring to procure information from any of our readers who may be able to afford it. The phenomenon, it is suspected, is attributable to some agent or cause which had acted over a very extensive range of country, and which, probably, produced similar effects, in many other places besides the banks of the three rivers above specified. We trust that if such effects were perceived by any of our readers, they will be so obliging as accede to the proposal and the request with which we conclude the present notice.

"On the morning of Tuesday, the 27th of November last, about six o'clock, the miller of Maxwellhugh Mill, situated on the Teviot, near its confluence with the Tweed, perceived a great diminution taking place in the water which flowed through his mill-course. At eight o'clock the water altogether ceased to flow. Thinking that the sluice had fallen down, or that the *cauld* [dam] had given way, he went up

to the cauld, and found, much to his surprise, that there was hardly any water in the river. There were here and there a few pools, where there were hollows in the channel; but there was no longer a running stream. The channel continued dry for four or five hours—after which the water began gradually to flow, till the waters reached the same level they were at previously. At this place the Teviot is on an average about 50 feet wide, and 2 feet deep.

"The same phenomenon took place in the Nith, in the parish of Durrisdeer, at Enterkinefoot. The channel was so dry, that a person could have walked across without wetting his stockings.

"It was observed also in the Clyde, a little above New Lanark. The extensive cotton-mills at that place were for some hours stopped, in consequence of an entire cessation of the current. Numbers of fish were caught with the hand, and many persons walked across without wetting so much as the soles of their feet.

"The above particulars we have taken from the newspapers, and we do not *vouch* for their perfect accuracy; but we have no reason to doubt it, as the statements have not been contradicted.

"It appears that the same phenomenon has occurred frequently before. In the Teviot, it is known to have occurred at least five times between the years 1748 and 1787. It happened also in the Clyde in the year 1787, and within a few days of its occurrence in the Teviot: and it is remarkable, that, in regard to both of these rivers, the part of the channel where their waters disappeared, turns out to be the very place where they disappeared last month. But there are several other rivers, both in England and in Scotland, where the same phenomenon has been observed within the last half-century.

"We feel satisfied that our readers will share with us an extreme anxiety to discover, if possible, the cause of this singular phenomenon: and we will now explain to them in what way they can be instrumental in assisting in this discovery.

"The first object should be to obtain a minute and accurate account of all the facts apparently connected with the phenomenon, at the places where it was observed. We are happy to learn that steps have been taken for this purpose by persons well-qualified for such an inquiry. But as it is just possible, that even they may not have gathered up all the circumstances calculated to throw light on the subject, our readers in these quarters would do well to note down, ere it fades from their memories, any thing particular which they observed.

"We may now allude to the different theories which have been started to account for the phenomenon, because they will immediately show the importance of gathering together as many facts as possible. It is by facts alone that these theories will be confirmed or refuted.

"Some persons ascribe the phenomenon to a severe frost which occurred on the morning of Nov. 27, and which, it is said, froze up the streamlets and springs that supplied the rivers where the phenomenon was observed. We cannot see how, on any philosophical principles, the effect here stated would follow from such a cause. But, even if it were sufficient to produce it, then the same phenomenon should have occurred in the Tweed, the Jed, and all the rivers where the frost reached. Moreover, it should be observed every winter, and it ought to have been very strikingly observed last winter. Besides, the waters should, after the frost gave way, have risen considerably above their usual level, which, it is said, was not the case.

"We have adverted to these inferences from the theory just mentioned, in order to show how its truth or falsehood may be tested; and many of our readers may be in possession of facts which will supply this test.

"Another theory has been proposed, which, we confess, appears much more probable. It is suggested, that a fissure may have been formed under or across the channels of the above rivers, into which their waters found their way. The current would thus cease to flow in its ordinary channel until the fissure closed, or was filled up by the sediment and water poured into it. The fissure might be either a crack across the country, or a local sinking of the ground. It is well known that earthquakes frequently produce such effects; and there are few years in which, in some parts of Scotland and England, the shock of an earthquake is not felt. When the Clyde stopped in January 1787, a rivulet in the parish of Strathblane, in Stirlingshire, which drove a mill, also disappeared. On the same day, the shock of an

earthquake was very sensibly felt in Glasgow and its neighbourhood. Whether or not at either of these places any fissures were observed, into which the streams flowed for a time, we have been unable to learn. That there are fissures, or *slips* (as the geologists call them), which everywhere intersect the crust of the earth, is well known to every collier and miner; and that there are such fissures in that part of the channel of the Clyde, where its waters have repeatedly disappeared (namely, between the uppermost fall and Corra Linn), is extremely probable. It might be thought, however, that, if a crack was produced, sufficient to allow the waters of a large river to escape, it would soon be discovered. But it is quite possible, that, after the lapse of a few hours, the crack might close again, and leave scarcely any external traces of its existence. Still, we cannot help thinking that some traces should be discoverable; and this is just one of the points on which our provincial readers may be able to afford information.

"We shall conclude by suggesting one or two points, to which, if any of our readers would be so obliging as to investigate the subject, their attention may be directed; and we doubt not, other points will occur to themselves:—

"1. Have phenomena, similar to those which occurred in the Teviot, the Clyde, and the Nith, on the 27th of November last, been observed, on the same day, or about the same time, in any other rivers in Great Britain?

"2. If so, at what hour were they first observed, and how long did they continue?

"3. Where is the highest place, in the course of the river, where its waters disappeared?

"4. Was any crack, or fissure, or sinking, or disturbance of the ground, visible at that place?

"5. Was the shock of an earthquake felt, anywhere, about the period above mentioned?

"6. Was there much or any ice on the river, or its tributaries, where the aforesaid phenomenon occurred?

"7. When the water began to flow again, did it rise to a higher level than it had been at previously?

"8. Is there any appearance of a slip, fault, dyke, or trouble in the strata, at or near the place where the waters began to disappear?

"9. Has this phenomenon, or anything similar to it, been observed in former years—and when?

"We may also repeat the queries 3, 4, 5, 6, 7 and 8, with regard to the stoppage of the Teviot, Clyde, and Nith; for on the subjects of those queries with regard to the phenomenon of the 27th of November, we are as yet uninformed."

See also some analogous facts mentioned by Perrey in his memoir "On the Earthquakes of Europe, and adjacent parts of Africa and Asia, from 1801 to 1843" (*Comptes Rendus*, Sept. 1843, last page but one of the memoir). Most of these phenomena have occurred in the winter and in higher latitudes; and although there are considerable difficulties in the way of the frost theory of accounting for them, and I incline to the view that it will hereafter be found to be the true one, yet there is sufficient to induce the question—Can it be *possible* that partial or local elevations, with or without fractures or earthquake, take place occasionally, and to such an extent as to change the levels of portions of the earth's surface, and for a time derange the flow of rivers, or other such main channels of drainage?

Those who embrace the views of Von Buch and Humboldt, &c., and admit the possibility of *boursoufflé* domes of trachyte, will be prepared to find no difficulty in imagining such comparatively small surfaces elevated and swollen up, by the assumed elastic forces beneath, so as to produce new and extemporaneous water-sheds; and although I cannot join in such views, the subject appears to me worthy of more examination at the hands of Vulcanologists and Seismologists.

*Nausea at the moment of shock.*—This curious effect of earthquake shock upon human beings, and if accounts are to be credited, also upon some domestic animals, is deserving of more attention than it has yet received.

The fact itself, as respects human beings, admits of no doubt. I have direct testimony of the boys of a large boarding-school being suddenly awakened at night by one of the North American shocks, and the greater number suffering from imme-

diate sense of nausea, amounting to vomiting in many cases. In the late earthquake at Naples (Dec. 1857) many instances were related to me by the sufferers. The question arises, Is the nausea an effect of the sudden disturbance of the nervous system by alarm, &c., or is it due to the movement itself, and analogous to sea-sickness? There are great difficulties in the way of either solution. Those most likely to suffer severely from nervous alarm, do not seem to be those most usually affected. The direct movements are very generally too sudden, sharp, and of too little duration, to admit of the second explanation. The facts, however, require to be more numerous, and to be scientifically collected and classified as soon after the occurrence as possible, and are commended to such physiologists as may be favourably circumstanced for the observation in earthquake regions.

*Indirect estimation of the force due to the shock.*—In our ignorance of the precise nature of the originating impulse, whether of one or of more than one sort, or of the degree of force at the centre of impulse necessary to transmit a wave, sensibly, to a given distance through the common formations of the earth's crust, any trustworthy observations, of the distance to which the very analogous blow produced by fired mines, or other masses of gunpowder, has been sensibly conveyed, are not to be at present neglected. The 2nd Report gives exact information as to the distances to which such impulses from fired powder, even of a feeble character, may be conveyed through the worst conducting material (sand), and made instrumentally sensible.

I have collected since that period a few occasional notices of the explosions of large masses of gunpowder, and of such facts as may be found, of the magnitude and distance of the impulse conveyed, which I here transcribe for reference. It would be very desirable that officers of engineers entrusted with demolitions, or requiring to explode very large masses of powder, would endeavour to provide for obtaining observations as to the precise radius of the superficial area at which the ground shock became insensible without the aid of instruments, and that such observations were accompanied by a general account of the nature of the geological formation, and of the physical features of the country around.

"The Monster Blast at Furness.—The monster blast of gunpowder at Furness Granite Quarry took place on Wednesday afternoon, with complete success. The charge consisted of no less than three tons of gunpowder, and was deposited in two chambers—one and a half ton in each. The shaft was 60 feet in depth, and the chambers in which the powder was placed were 17 feet long. The charge was ignited by a galvanic battery, and lifted an immense mass of rock, computed to have been between 7000 and 8000 tons. The flame belched out on the seaward side, and was well seen by a large concourse of spectators from Inverary, the watering places of the Clyde, and a party of excursionists from Glasgow, on board the 'Mary Jane.' The report was not loud, but deep and hoarse, and the ground in a very wide circle was strongly agitated."—Glasgow Constitutional, October 5, 1852.

The 'Journal de Turin' of the 29th ult. has, under the head of "latest intelligence," the following paragraph:—"TURIN, 11.45 A.M. Two successive shocks have been felt like those of an earthquake. The powder magazine of Borgo Dora has exploded. The population is hurrying to the scene of disaster. The rappel is being beaten. All the faubourg is on fire. A barrack has fallen down. Two hundred deaths are spoken of."—Saunders's Newsletter, May 1852.

It is quite probable that both in this case and in that of the magazine at Mayence, which subsequently exploded, information might still be obtained as to the weight of powder fired and the extreme distance to which the shock was felt.

"Improvement of the Port of Brest.—The 'Moniteur de la Flotte' states that M. Verrier, engineer, charged with the work of clearing away the Rose Rock, which obstructs the entrance of a part of the harbour of Brest, called the Penfield, made an experiment a few days ago, which was perfectly successful. One of the convicts, covered with a diving-dress, descended to the rock at half-tide, and deposited a box full of gunpowder, to which were fitted two gutta-percha tubes, also similarly filled. As soon as the man had come up, a light was applied to the tubes, and shortly after a loud cracking noise was heard, and a large column of water, with fragments of stone and a quantity of sand and mud, were thrown up to the height of 20 feet. The commotion was so great, that the Bastion de la Rose, which stands near,

trembled to its foundation. The mass thus moved has been considerable."—Times, April 17th, 1857.

The following is the 'Times' account of one of the explosions at the siege of Sebastopol :—

"Thursday, Aug. 30, 1855.—The whole of the camp was shaken this morning at 1 o'clock by a prodigious explosion, which produced the effects of an earthquake. A deplorable accident had occurred to our gallant allies as they were pursuing their works with accustomed energy. A tumbrel, from which they were discharging powder into one of the magazines near the Mamelon, was struck by a shell from the Russian batteries, which burst as it crashed through the roof of the carriage, and ignited the cartridges within; the flames caught the powder in the magazine, and, with a hideous roar, 14,000 rounds of gunpowder rushed forth in a volcano of fire to the skies, shattering to atoms the magazine, the tumbrels, and all the surrounding works, and whirling from its centre in all directions over the face of the Mamelon and beyond it 150 officers and men. Masses of earth, gabions, stones, fragments of carriages, and heavy shot were hurled far into our works on the left of the French, and wounded several of our men. The light of the explosion was not great, but the roar and shock of the earth were very considerable. The heaviest sleepers awoke and rushed out of their tents. The weight of powder exploded was about seven tons, or 1400 rounds of 10lbs. each."—Times, Sept. 13, 1855.

The following is part of the French account of the expedition against Kertch :—

"May 26th, 1855.—Finally, before evacuating Yenikale, they blew up a powder magazine, containing about 30,000 kilogrammes of powder: the shock was so great, that many houses were destroyed, and vessels anchored ten miles out at sea felt it severely."—'Moniteur' quoted by 'Times,' June 1855.

And the following of the great explosion in the camp before Sebastopol, on the 15th of November 1855 :—

"Shortly after 3 o'clock on Thursday afternoon the whole camp, from Inkermann to far beyond Cathcart's Hill, was literally shaken throughout every square foot of its area, by the most tremendous explosion that has ever echoed through these Crimean hills. A greater quantity of gunpowder itself may have been exploded in some of the magazines discharged for the destruction of the buildings and works after the abandonment of the ruined city and fortress; but this is doubtful, and certainly there were never fired at the same time so great a number and variety of deadly and explosive projectiles. The force of the blow from the impelled air, the stunning noise, the flashing of the fire, the suffocating smoke, arrested every reasoning faculty, and took away all sense, save the instinctive impulse to fly from the source of evil. Among the regiments themselves of the light division, whether in tents or huts, a sudden sensation was felt as if of an upheaving of the ground, at the same time that a violent shock was experienced from the concussion of the air. Almost instantly followed the loud report of the explosion; not sounding as if a single charge or magazine had been fired, and without the ringing tone or decided character of a salvo of artillery; but seeming rather as if a number of magazines had been discharged, one after the other, so rapidly, that all the reports were blended into one. As the thunder of the first report subsided, its place was occupied by the sharp cracking sounds of shells bursting high in the air, the rush of fragments falling to the ground, and the loud bangs of shells which had been scattered and were exploding on all sides. Simultaneous with these, almost from the very commencement, was the crushing of wooden huts, splitting of timbers, and noise of falling glass from the broken windows. The tents were violently agitated, and sometimes the cords or poles were snapped asunder. Then followed a continued succession of minor reports, and the roar of flames, and crackling of burning wood, as the fire advanced and increased among the huts and artillery stores of the siege train dépôts. To say that it equalled in violence the combined salvos of a thousand parks of artillery might seem extravagant; and yet the simile would but feebly convey an idea of the volume of thundering sound that shook the earth for miles around, tearing down the most substantial masonry and wooden huts, and levelling tents as by the sweep of some invisible giant-arm. I had seen the explosions on and after the 8th of September, which so many pens have since described; but no half-dozen of them

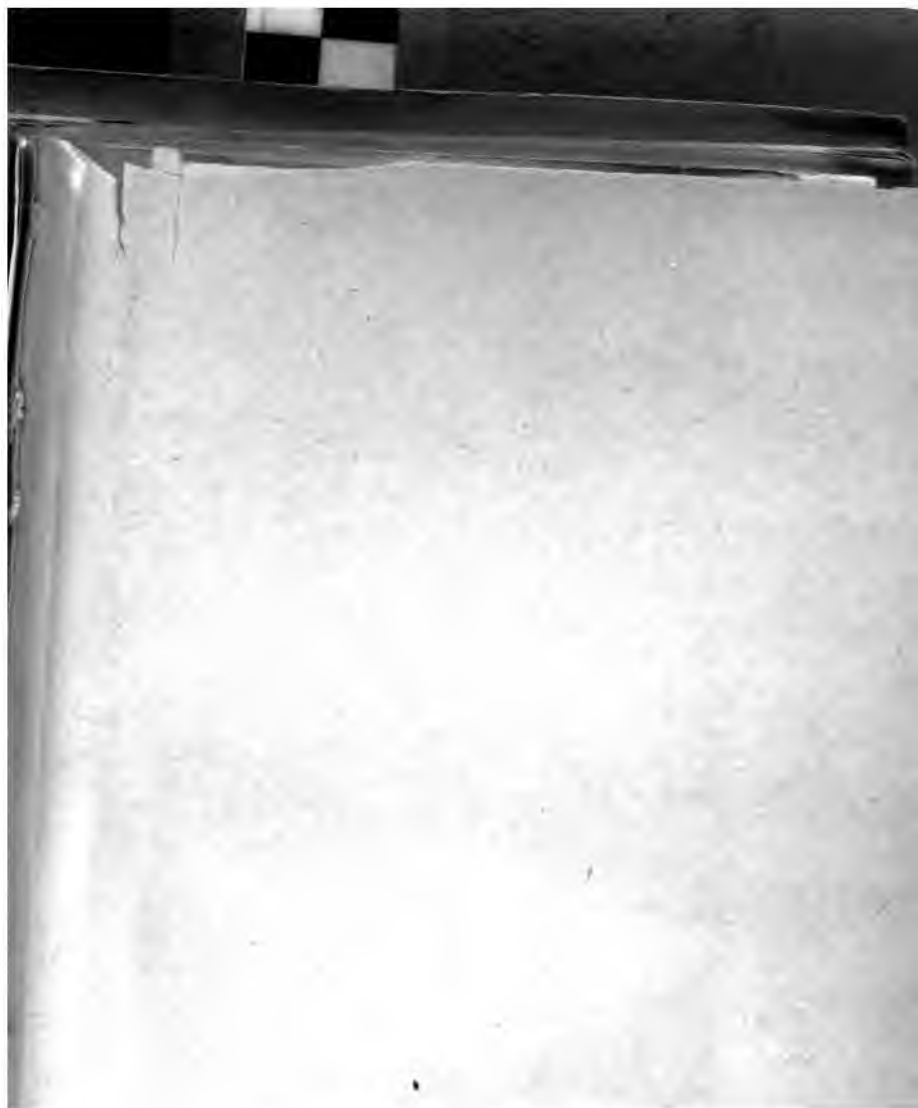


together would have equalled this one, either in force or sound. Over an area of nearly half a mile from the spot of its occurrence, the air was one huge column of powder smoke and cast-up earth, up into and athwart which ignited or exploding shells and rockets ever and anon darted and flashed by hundreds, spreading destruction to nearly everything animate and inanimate, within a radius of more than a thousand yards. Heavy siege guns were wrenched from their carriages and thrown many perches from where they had been standing, whilst the carriages themselves were torn asunder."—*London Express*, Nov. 29, 1855.

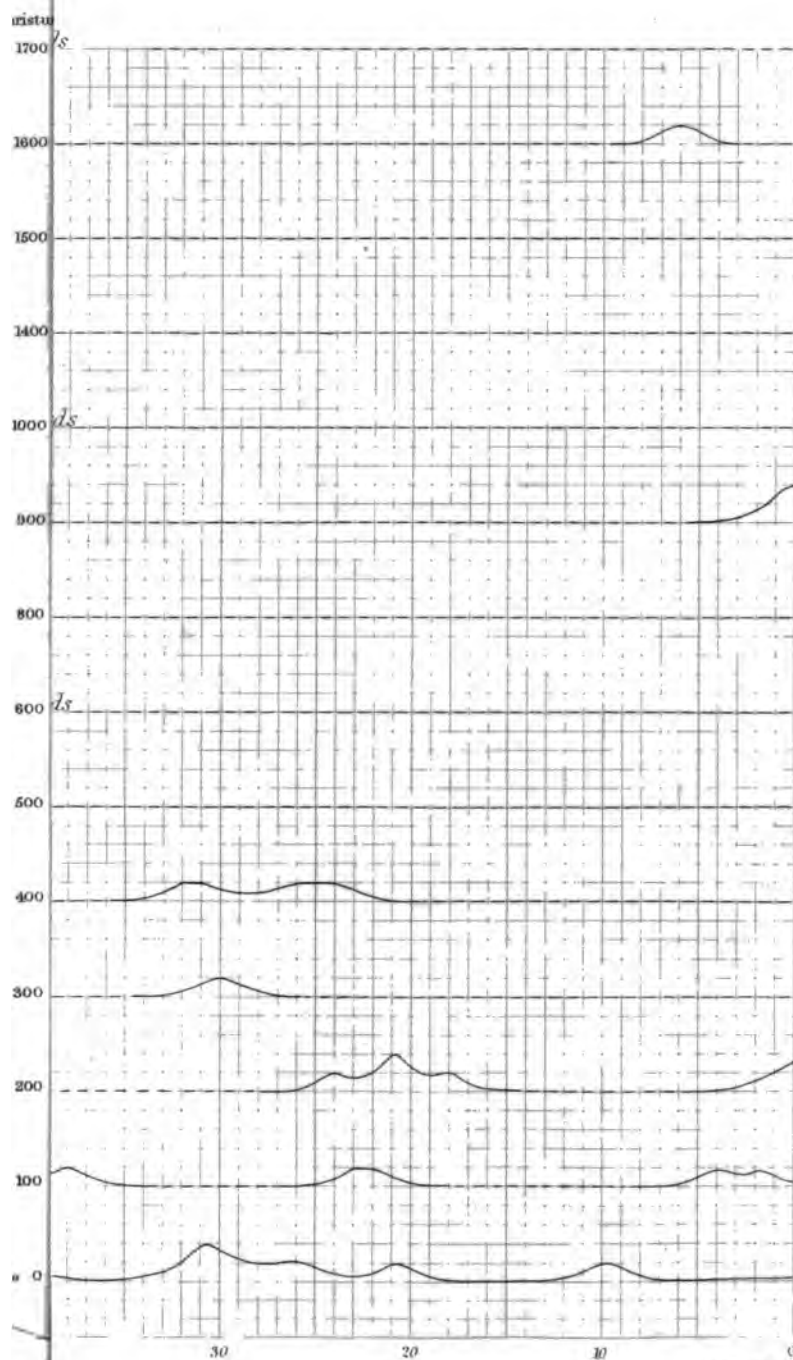
The following notices of the Great Blast at Seaford Cliff are extracted from 'Saunders's Newsletter' of September 15, 1856:—

"The great explosion at Seaford.—There has been a great concourse of visitors in this little town today to witness the operation of 'blasting,' by the explosion of gunpowder, an immense mass of chalk cliff from the heights down upon the beach, there to form a barrier which may check the drifting of the shingle towards Beachy Head and the east. The ground about Seaford for two miles to the west lies low, and there is nothing to protect it from the inroad of the sea at high tides but a narrow beach bank of shingle. This barrier is becoming gradually weaker in consequence of the tendency of the shingle to drift away, and it has become a matter of urgent moment that this should be stayed. Close to Seaford, on its eastern side, rises a noble line of cliff, in some places 300 feet high, and averaging above 200. It was determined to project a huge slice of the cliff on to the beach, with a view thereby to constitute a groin for the purpose of retaining the shingle and preventing its leaving the bay. The operations have been conducted by the Board of Ordnance. The spot selected is not much above half a mile to the east of Seaford. At a height of about 50 feet above high-water-mark there was driven into the cliff, or excavated, a tunnel or gallery 70 feet long, 6 feet high, 5 feet broad, ascending with a slope of 1 in 3. At the inland extremity it turned right and left in the heart of the cliff, above 50 feet one way and above 60 the other, with a more gentle ascent, the two smaller galleries being 4 feet 6 inches high, and 3 feet 6 inches broad, and the three being in the form of a capital T. At the utmost end of each of the side or cross galleries was a chamber, 7 feet cube, lined with wood; and in each chamber a charge of no less than 12,000 lbs. of gunpowder was deposited; making the distance of the centre of the charge 70 feet from the face of the cliff towards the sea, and about 70 feet above high-water mark. The galleries were 'tamped,' that is, stopped up, with bags of sand, and chalk in bags and loose, to within 50 feet of the mouth, both branches being tamped up, and 20 feet down the large gallery. It was not till 12 minutes past 3 o'clock, that suddenly the whole cliff, along a width or frontage of some 120 feet, bent forwards towards the sea, cracked in every direction, crumbled into pieces, and fell upon the beach in front of it, forming a bank down which large portions of the falling mass glided slowly into the sea for several yards like a stream of lava flowing into the water. The whole multitude upon the beach seemed for a few moments paralysed and awe-struck by the strange movement, and the slightly trembling ground; everyone sought to know with a glance that the mass had not force enough to come near him, and that the cliff under which he stood was safe. There was no very loud report; the rumbling noise was probably not heard a mile off, and was perhaps caused by the splitting of the cliff and fall of the fragments. There seemed to be no smoke, but there was a tremendous shower of dust. Those who were in boats a little way out state that they felt a slight shock. It was much stronger on the top of the cliff. Persons standing there felt staggered by the shaking of the ground, and one of the batteries was thrown down by it. In Seaford, too, three quarters of a mile off, glasses upon the table were shaken, and one chimney fell. At Newhaven, a distance of three miles, the shock was sensibly felt. The mass which came down is larger than was expected; it forms an irregular heap, apparently about 300 feet broad, of a height varying from 40 to 100 feet, and running 200 or 250 feet or more seaward, which is considerably beyond low-water mark. It is thought that it comprises nearly 300,000 tons."

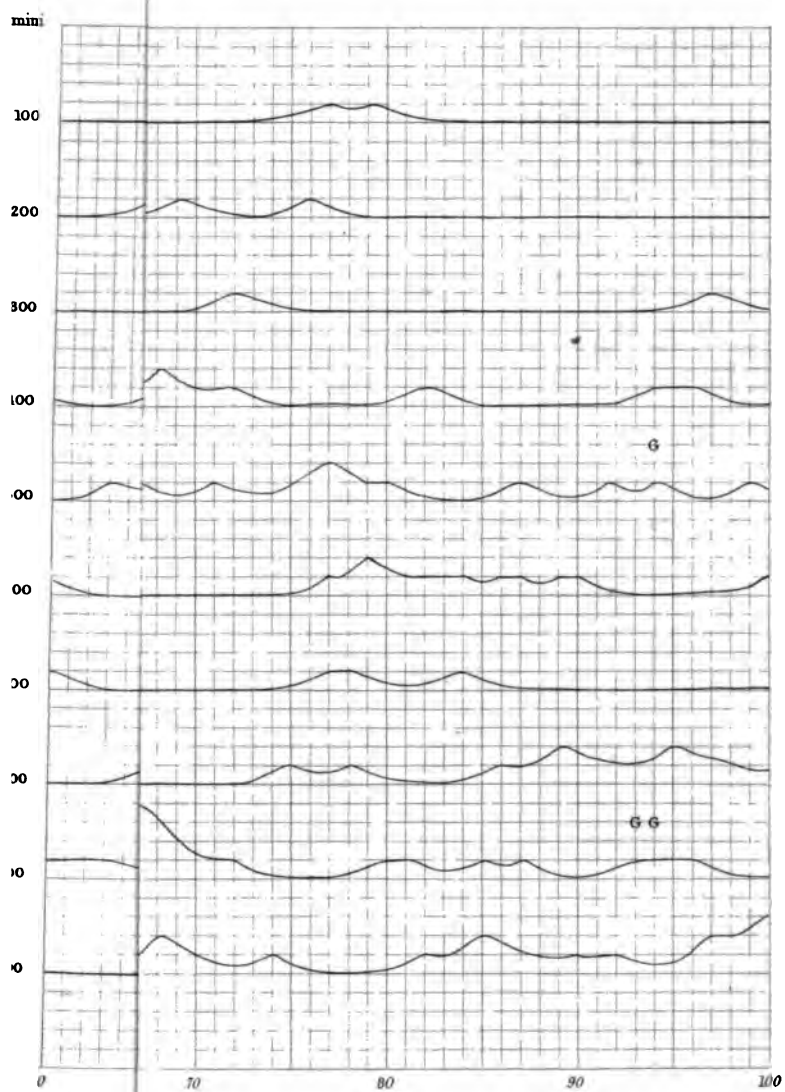
These meagre and most imperfect accounts, as respects the object here in view, will however, it may be hoped, direct future attention to more precise observation of the data required.



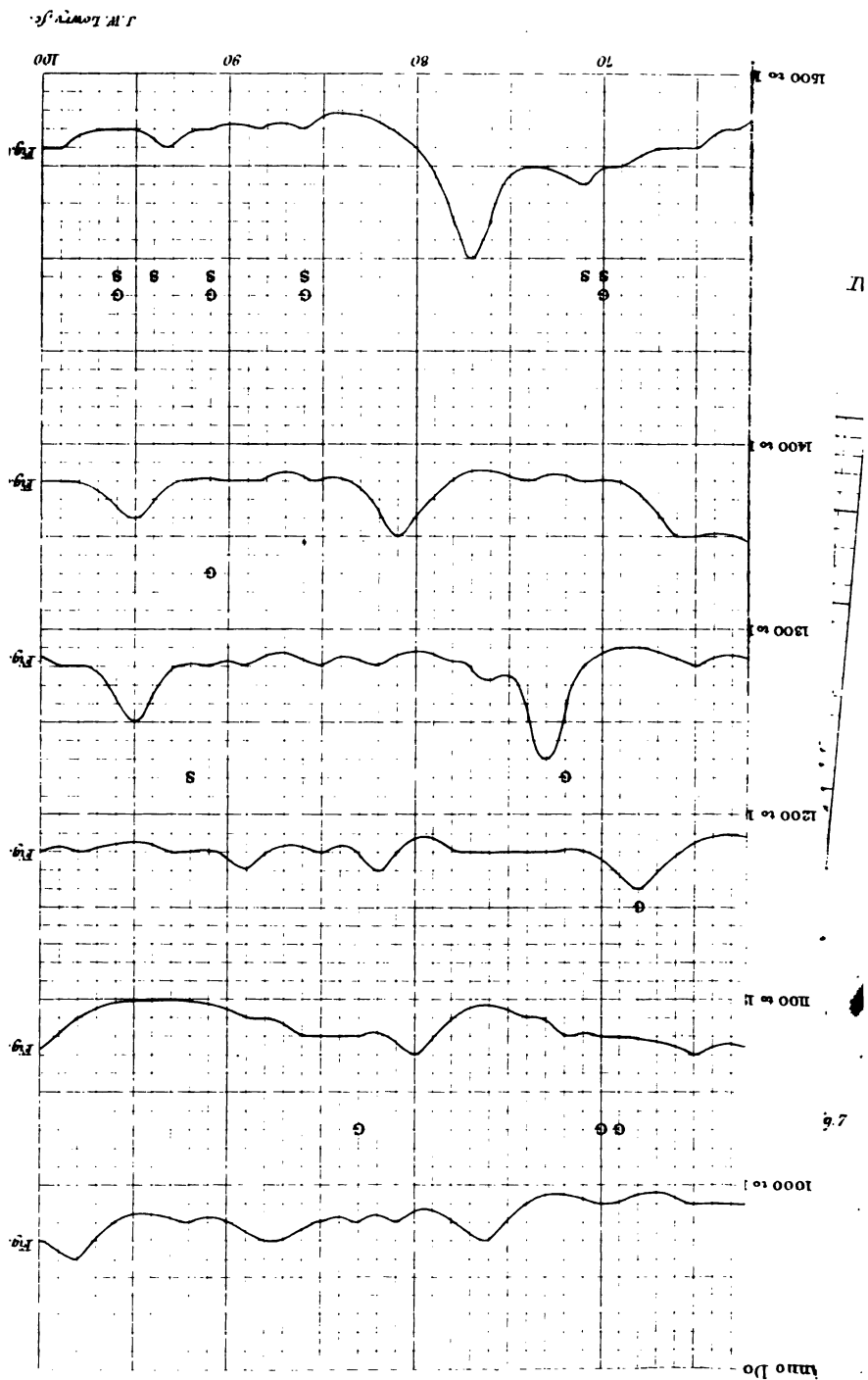








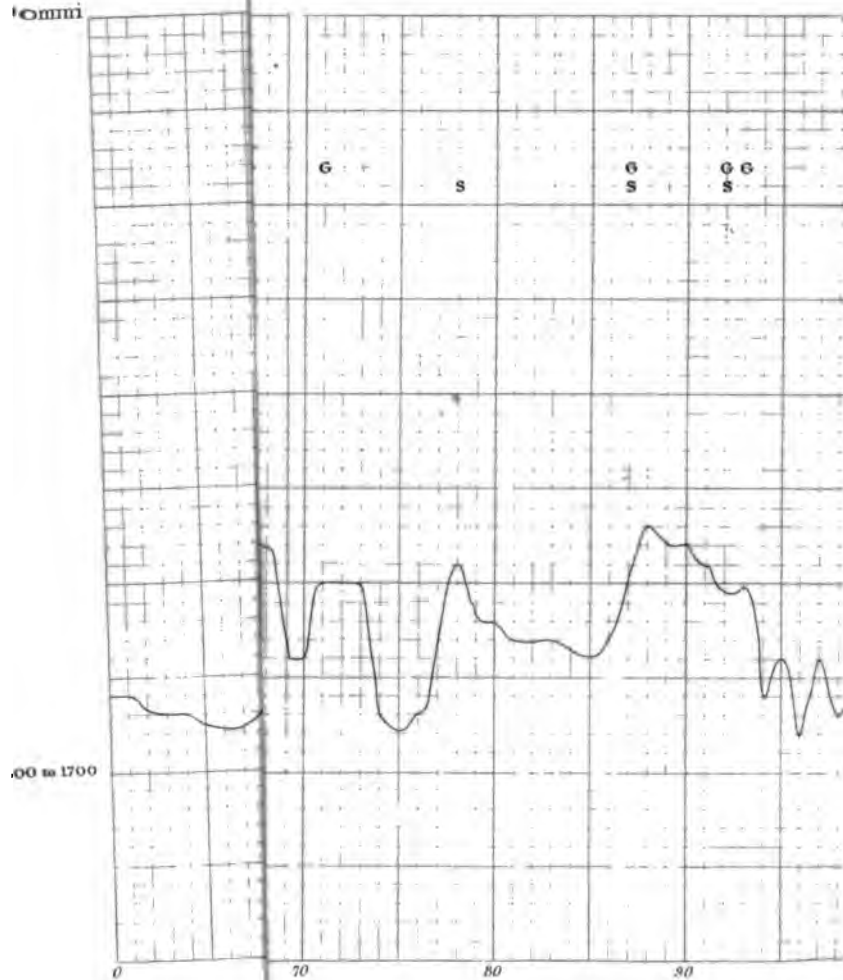




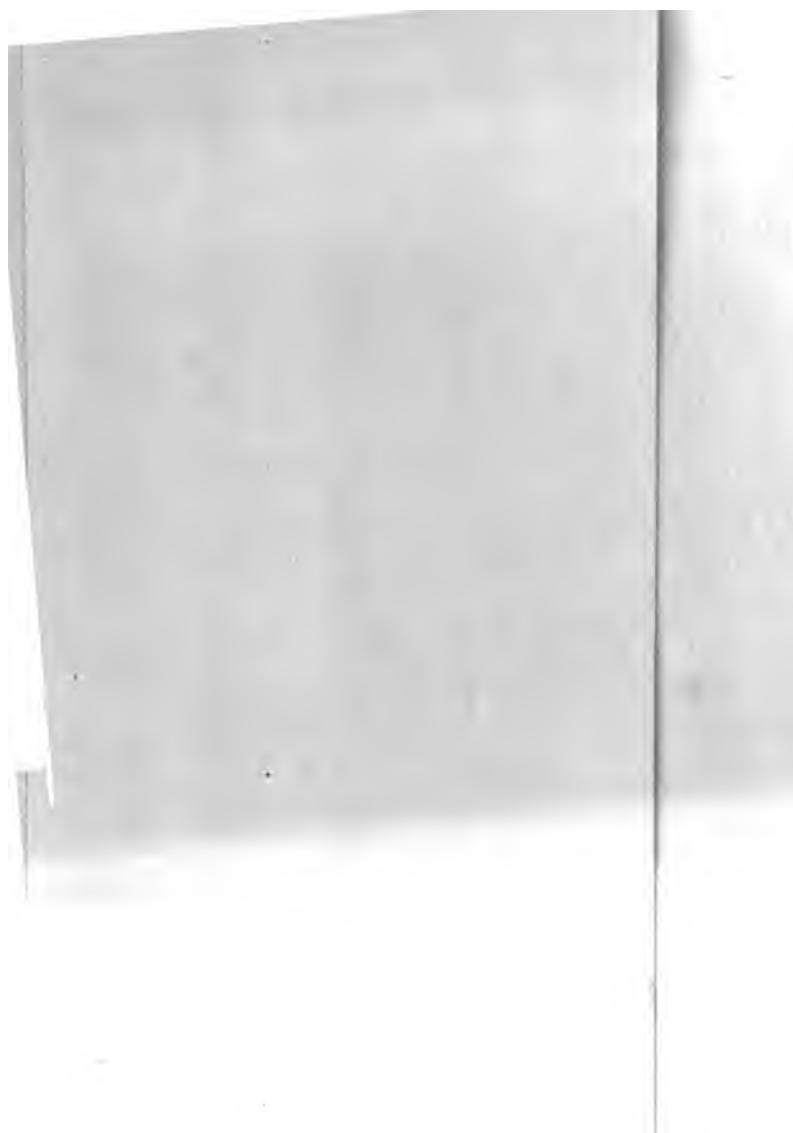




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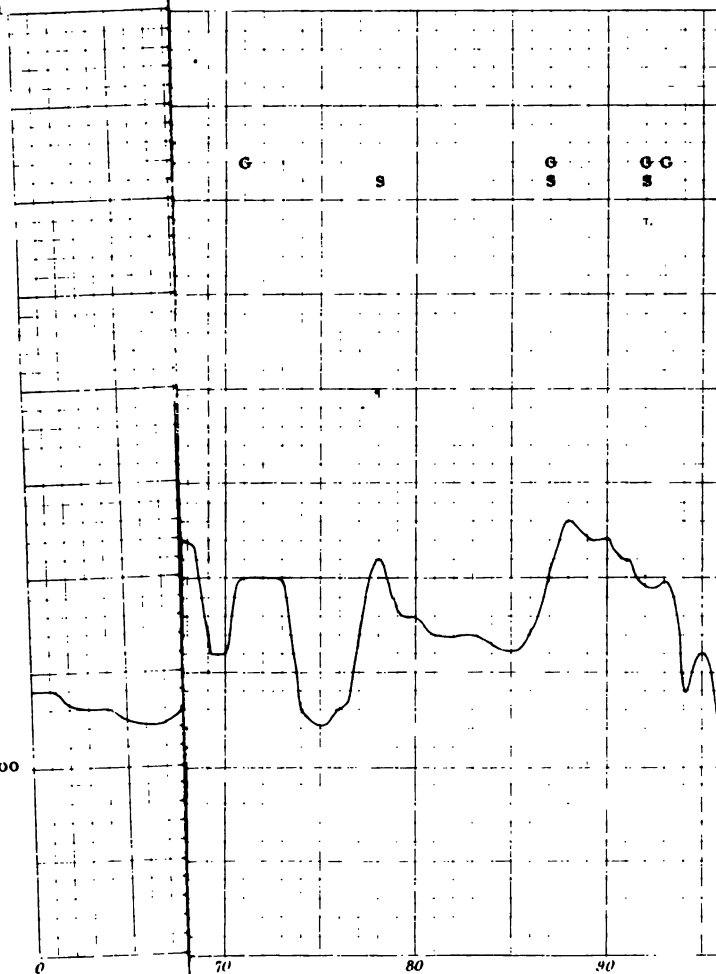
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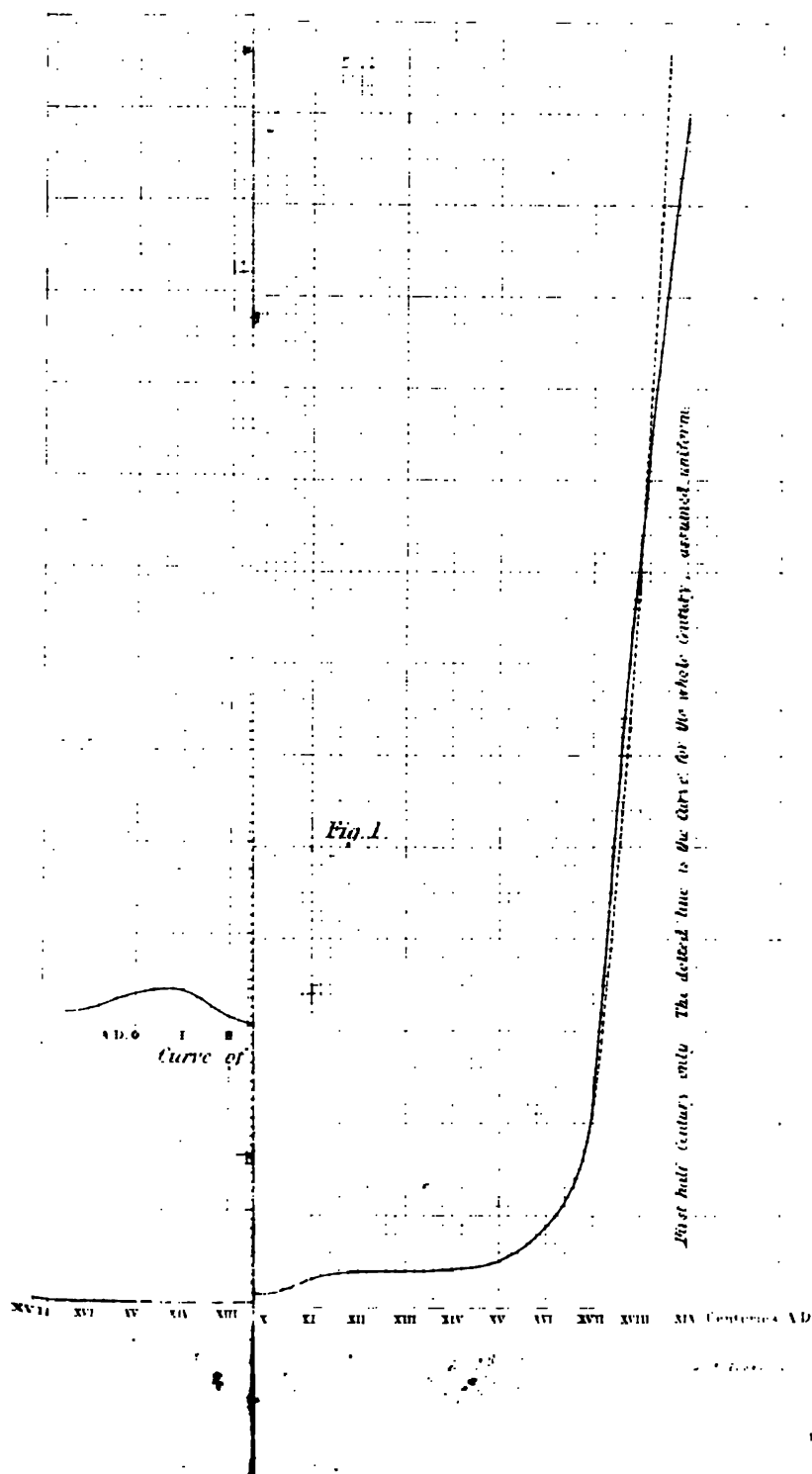
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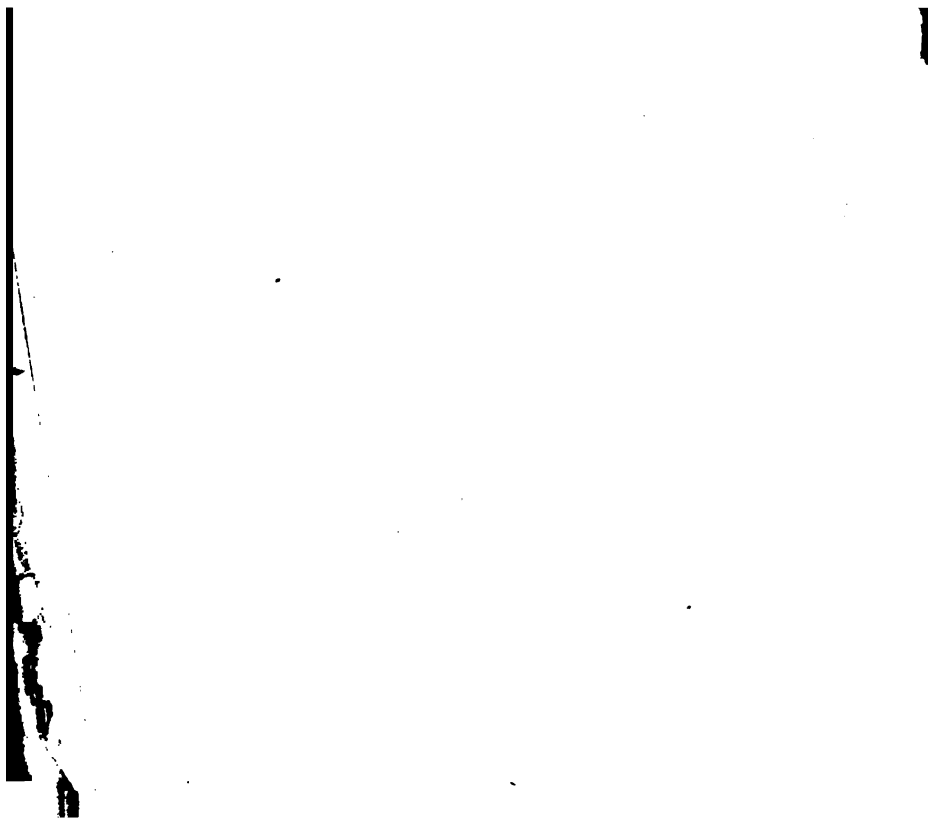
PLATE VI

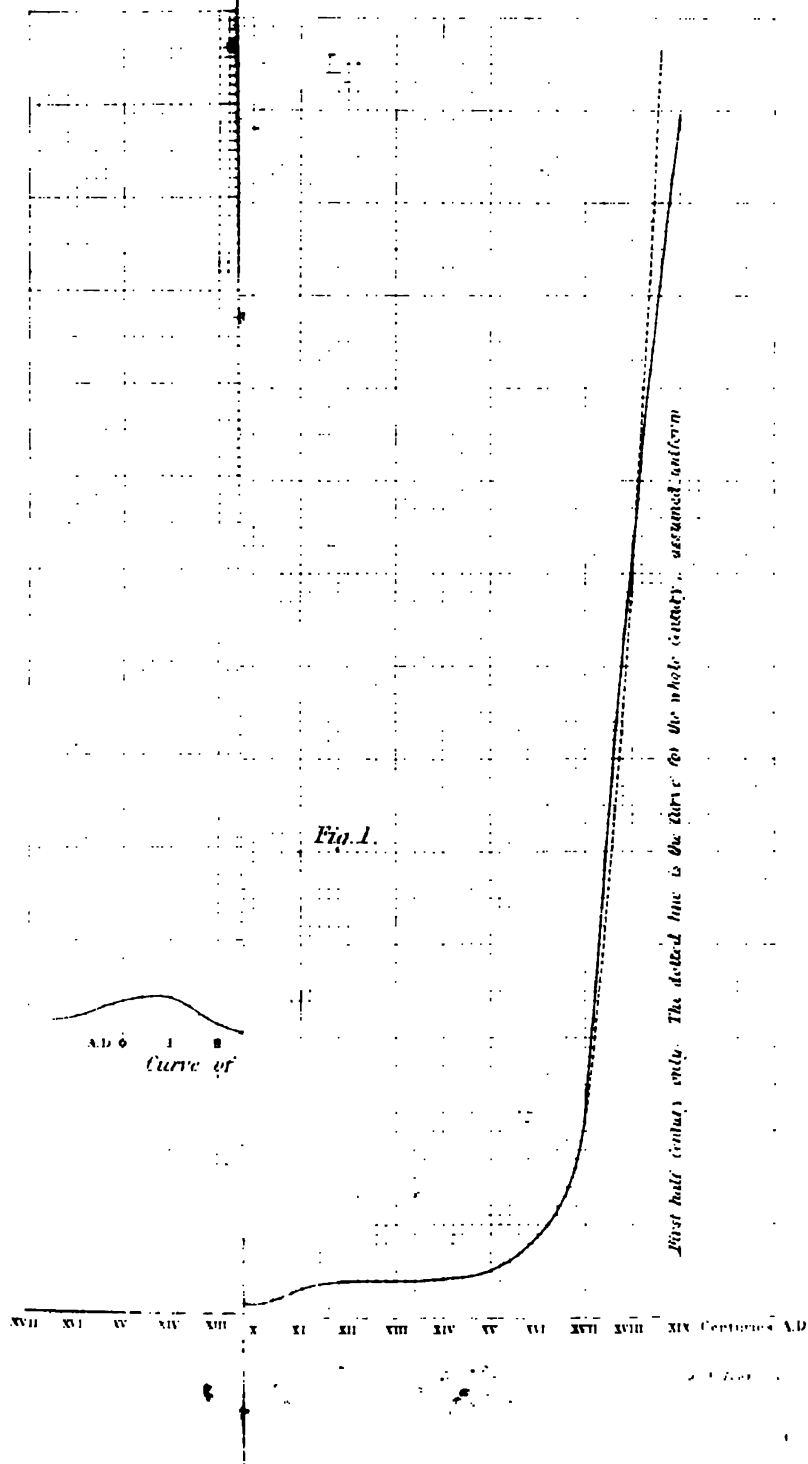








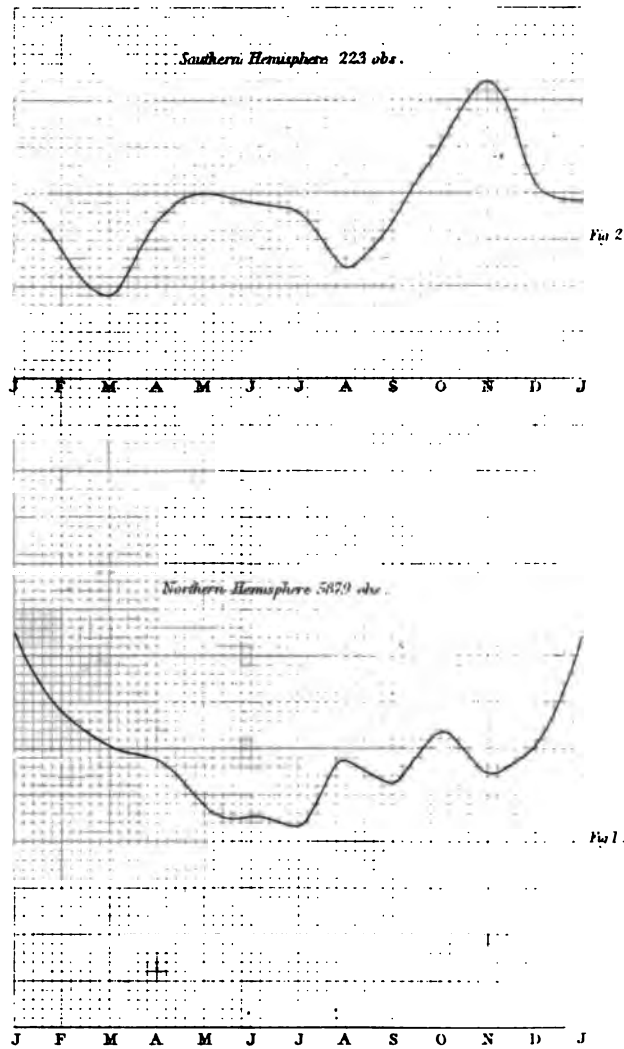






*Distribution in Time.*

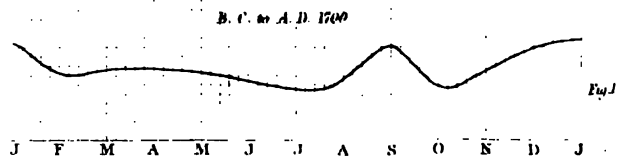
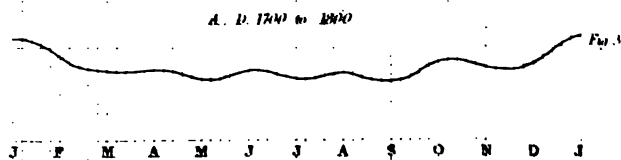
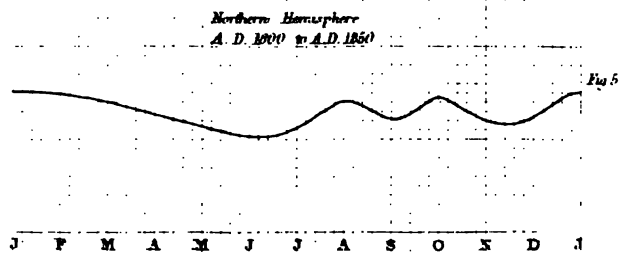
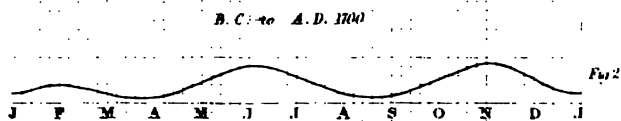
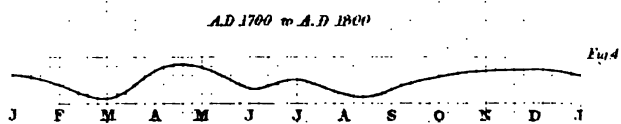
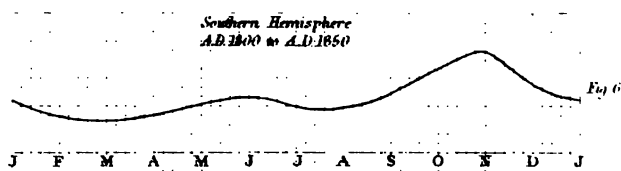
*Curves of Monthly Seismic Energy  
from the entire Period.*



*Vertical Scale is that of Fig. 2*

*J.W. Lowry, fec.*

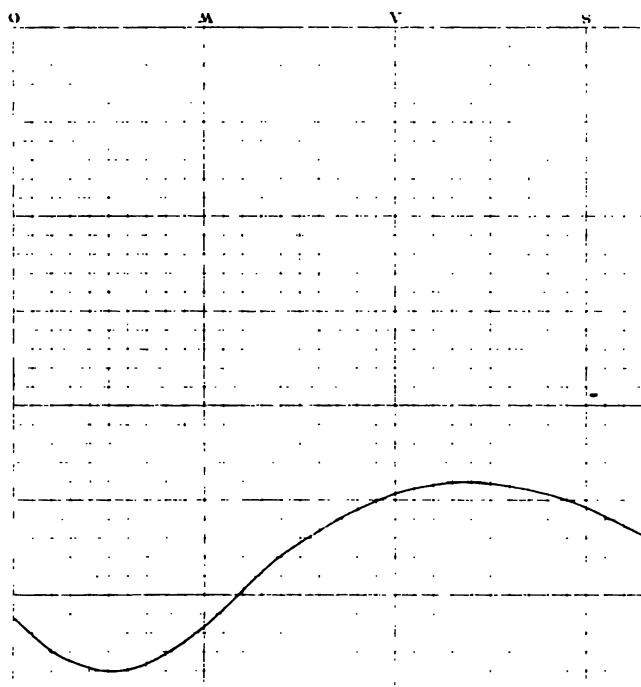


*Distribution in Time**Mensual curves of Seismic Energy**For corresponding periods. Northern & Southern Hemispheres.*

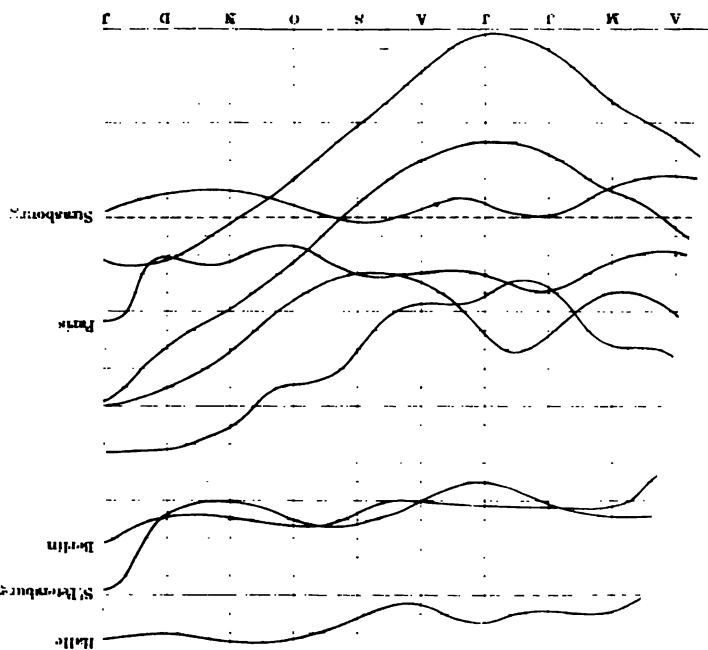
J. W. Lowry, f.



Energy, R.P.



at and Solstitial curves of comparative *Synsine Energy*  
for the whole period and for both Hemispheres.

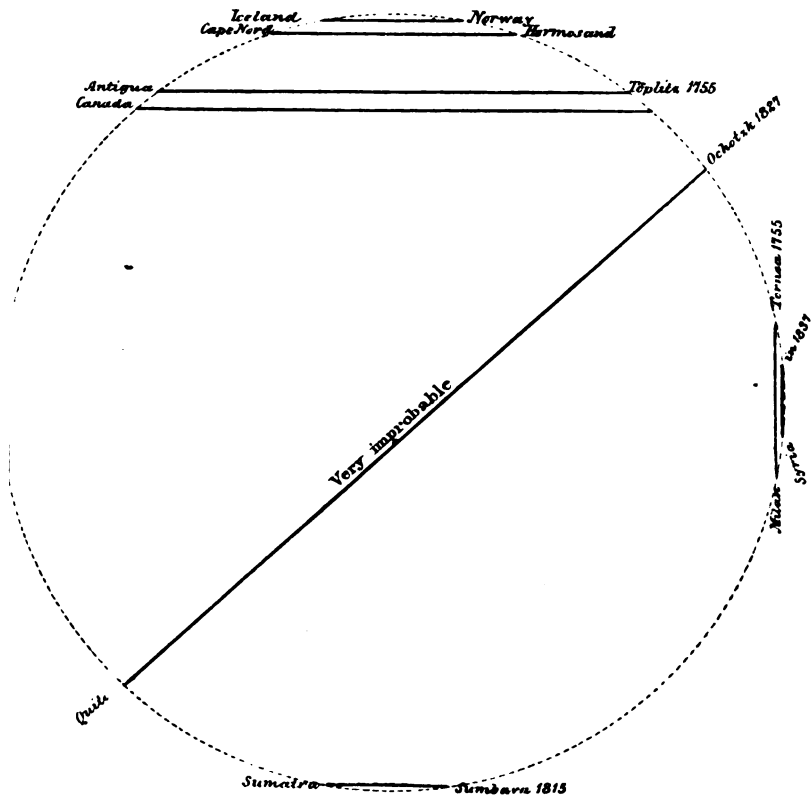


*Distribution in Time.*  
Barometric Pressure, at different latitudes





SEGMENTS APPARENTLY CUT OFF BY SOME GREAT EARTHQUAKES.



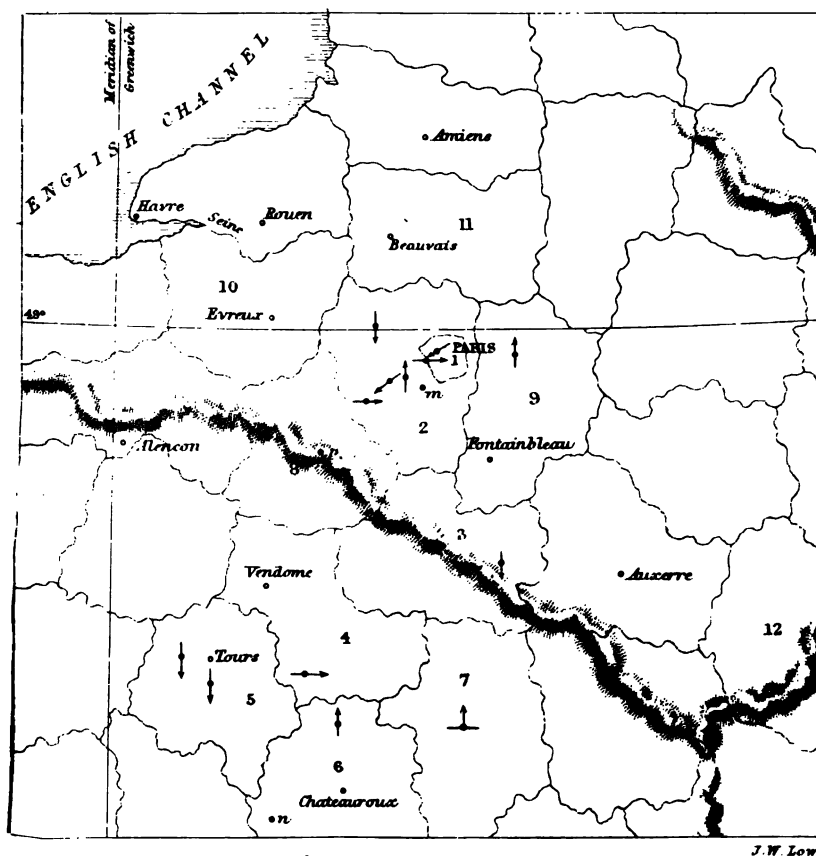


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# PART OF FRANCE.

DIVIDED INTO DEPARTMENTS,

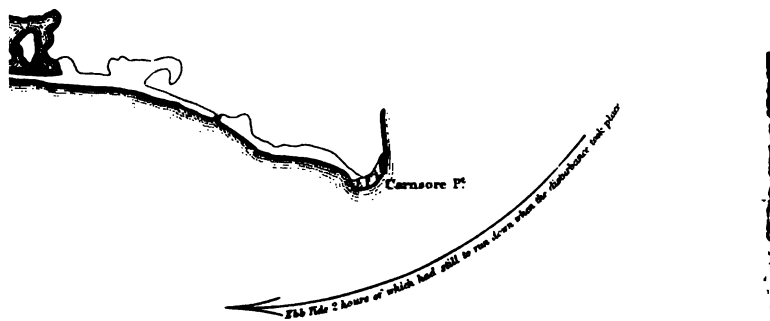
*Referring to the Earthquake of 5<sup>th</sup> July, 1841.*



## REFERENCE

→ Horizontal direction      ↑ Vertical shock.

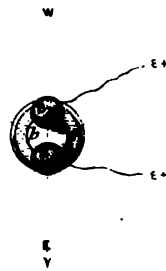
Plate XIII.



— SALTEE ISL<sup>d</sup>



Fig. 6.



Full size  
Part of Ball B

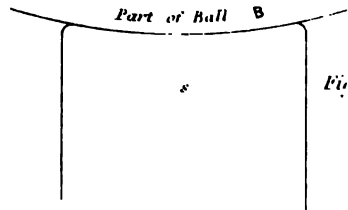


Fig. 7.

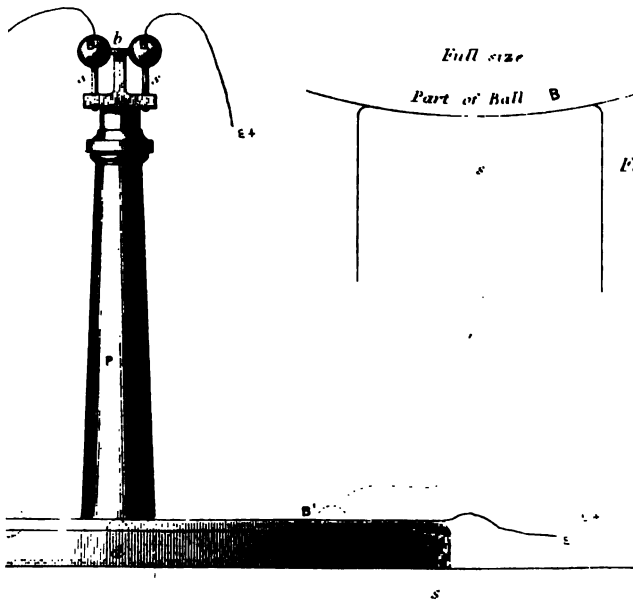
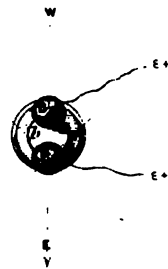






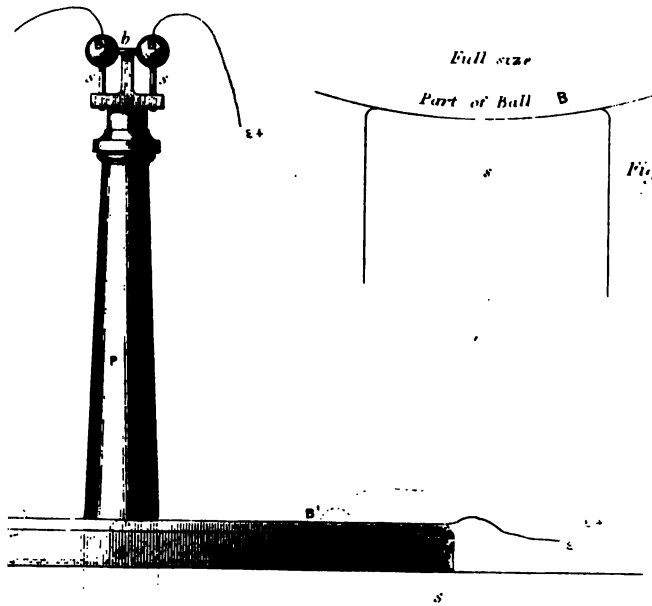
Fig. 6.



Full size

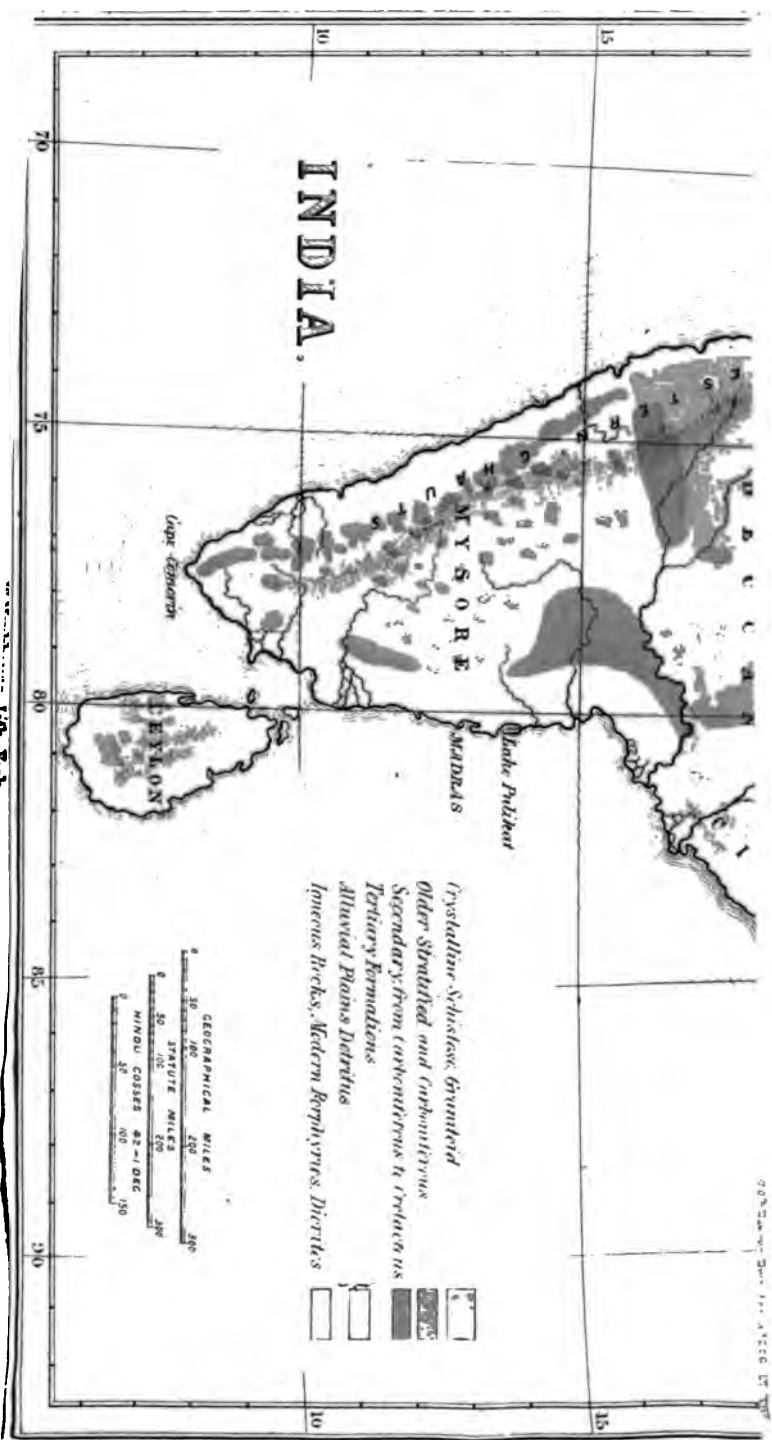
Part of Ball B

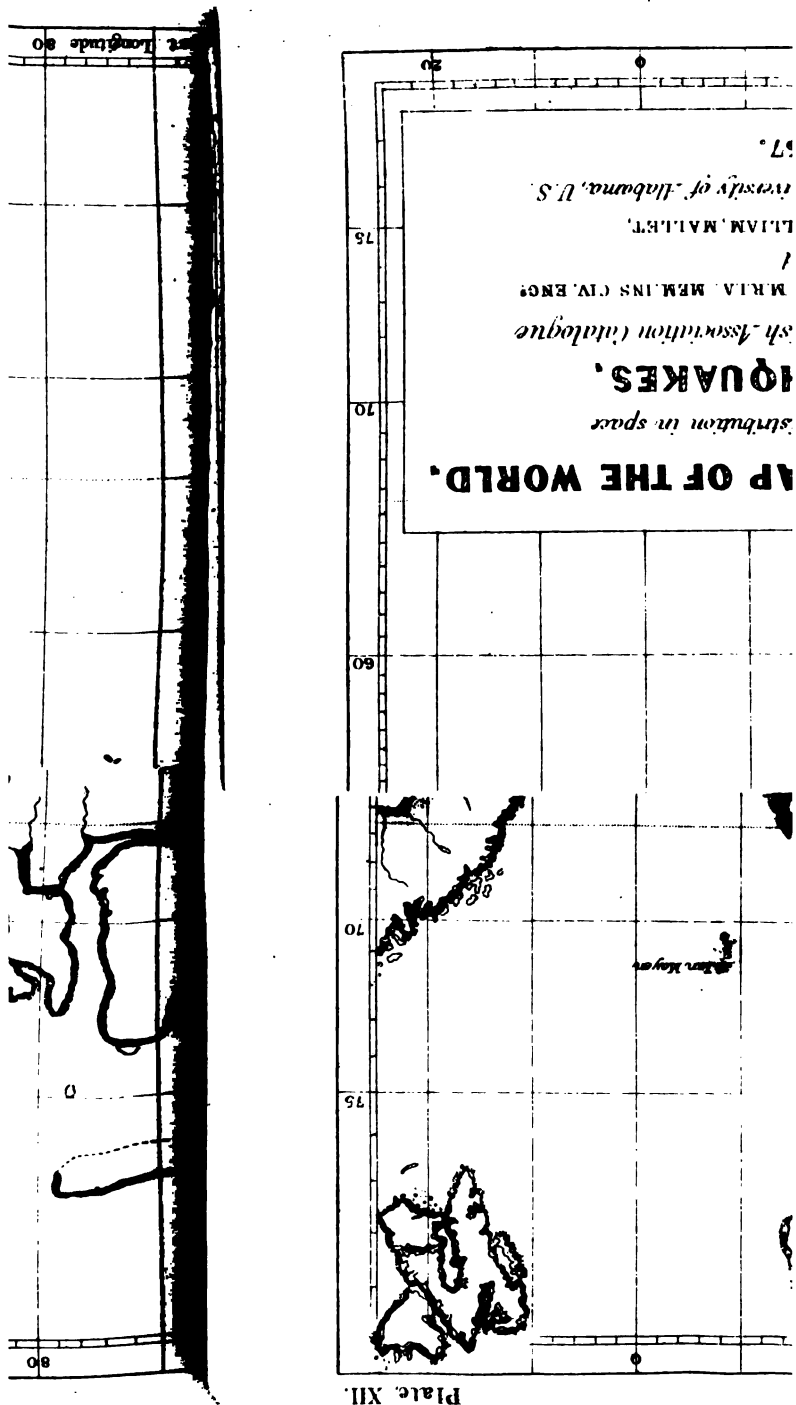
Fig. 7.





MAP OF INDIA, REFERRING TO THE GENERAL AND LOCAL OBSERVED DIRECTIONS OF EARTHQUAKE SHOCKS.







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